The FINGER PRINT INSTRUCTOR

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City of New York

Based upon the Sir E. R. Henry
System of Classifying and Filing

A text book for the guidance of Finger Print Experts
and an instructor for persons interested
in the study of Finger Prints

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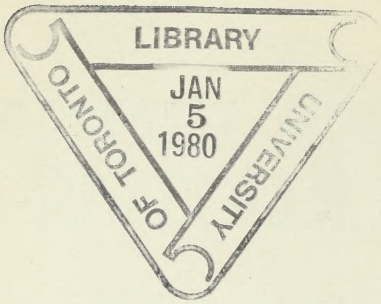

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INTRODUCTION

ALTHOUGH there are various systems now in use for the classification of finger prints, such as the "Conley," the "Flak-Conley" (which is an improvement on the Conley) and the "French System," the system most universally adopted, and upon which the Finger Print Instructor is based, is the "Henry System," which was originally adopted by the English Government.

Since the adoption of finger impressions by various departments (both national and international) as a means of making positive identifications, the public has deemed the subject to be a very mysterious and complicated one, for the reason that all previous publications on finger prints fail to explain the system in a manner that would enable a person of ordinary intelligence thoroughly to master and understand it in every detail. In writing this book, an endeavor has been made to remove the mystery (which is only imaginary), by explaining the method of taking, classifying, comparing and filing finger impressions, in every detail, and in language that does not require a college education intelligently to understand.

It is very important that laymen should know something about finger impressions, as they are the persons usually called upon for jury duty, and very often they are required (when serving as jurors) to pass judgment upon cases in which finger prints are introduced by the police, as the only evidence to show that the person on trial committed the crime with which he is charged. As finger print evidence is comparatively new, difficulty is frequently experienced in convincing a jury that the testimony of finger print experts is competent, reliable and positive evidence, while in cases where handwriting

is in question this doubt does not exist in the minds of the jury, the testimony of handwriting experts being usually accepted by them as trustworthy.

In order to remove the doubt that exists at the present time, and to prove that the testimony of finger print experts is superior to that of handwriting experts, the following comparisons have been made:

> Finger impressions are from the body, and cannot be disguised, forged or altered by anybody, in any manner whatsoever; while the handwriting of a person can easily be disguised, altered or forged by any good penman.

> Finger print experts can make positive identifications almost instantly, without hesitation; while handwriting experts require days and sometimes weeks to make examinations and comparisons, before rendering their decision.

> The testimony of a finger print expert is not subject to contradiction by another finger print expert, for the reason (as stated above) that the print is from the person; while in cases of testimony by handwriting experts there is always a possibility of contradiction, because the identification of handwriting is merely the opinion of a person who has made a study of detecting similarities in the formation of letters; and another expert, who is just as competent, might not agree with the conclusions of the first expert, thus giving cause for doubt.

The following opinion, rendered in the Appellate Division of the Supreme Court, will serve to show the attitude of the judges in the higher courts toward the acceptance of the testimony of handwriting experts:

From *The Chief*, August 8, 1914.

PATROLMAN DISMISSED ON TESTIMONY OF HANDWRITING EXPERT REINSTATED

COURT HOLDS THAT TOO MUCH RELIANCE WAS PLACED ON IT

"The relator was dismissed from the police force of the City of New York because he wrote an anonymous letter to the Commissioner of Police and denied it. I think the proof of his guilt, tested by the criterion of subdivision 5 of section 2140 of the Code of Civil Procedure, is not sufficient. The direct evidence against him is the testimony of an expert on handwriting, founded on his comparison of the letter and certain writings of the relator, whereby the expert reached an irresistible conclusion. I have no intention to reflect upon this expert or to belittle him. He stands high in his calling and is a frequent witness. But this kind of evidence is characterized by our Court of Appeals as of a dangerous nature. (Hoag v. Wright, 174 N. Y. at 433). And in Hardy v. Harbin (164 U. S. at 605), Hunt, J., quotes with approval the words of Bennet, J., in Adams v. Field (21 Vt. R. 256) as follows: 'Those having much experience in the trial of questions depending upon the genuineness of handwriting will not require to be reminded that there is nothing in the whole range of the law of evidence more unreliable or where courts and juries are more liable to be imposed upon.' And in Black v. Black (30 N. J. Eq. at 224), Van Fleet, V. C., says: 'The opinion of experts based on comparison alone is evidence of low degree, and has been regarded by eminent judges much too uncertain, even when only slightly opposed, to afford a safe foundation for a judicial decision.' Qurney v. Langlands, 5 Barn. & Ald. 185; Doe v. Suckermore, 5 Ad. & El. 751; 1 Greenl. Ev. Sec. 580, note (2); Stark. Ev. note (e). Mr. Moore in his valuable work on Facts has assembled various judicial utterances to the effect that this kind of evidence is most unsatisfactory, very

inconclusive, most unreliable and of the lowest probative force. (Moore on Facts, Sec. 615.) And an eminent writer has said that 'A jury is bound, therefore, to accept the opinion of an expert as to handwriting, even when uncontradicted, as an argument rather than a proof, and to make allowance for all the disturbing influences by which the judgment of the expert may be moved.' (1 Whart. on Evidence, Sec. 722.) And finally, it is common knowledge that experts of the highest standing, even when most positive in their opinions, have erred. And see Moore on Facts, Sec. 634. The peculiar value of cross-examination of this kind of witness is recognized (Hoag v. Wright, supra, at 42), and yet in the case at bar, by the refusal to adjourn the trial in order that the relator's counsel might attend, until after this expert was dismissed from the stand, the relator was deprived of the benefit of counsel's services in cross-examination of this witness. I think the determination should not be confirmed, and therefore I advise that the writ should be sustained, that the determination should be annulled and the relator restored to his office, with $50 costs and disbursements."

The attention of the officials of small cities and villages, where there is at present no system of identification, is called to the simplicity and small cost at which the finger print system could be installed, thus enabling them positively to identify all persons arrested by them (who may have a criminal record), without the expense attached to the installation of the Bertillon system of measuring. There is no doubt that eventually the recording of criminals under the measuring system will be entirely abolished, and the finger print substituted; for the reason that the characteristics and formation of the ridges in impressions positively remain the same throughout the natural life of a person and for some time after death, while the measurements cannot actually be relied upon until a person has ma-

tured, which is usually at the age of 21 years; even then discrepancies are liable to occur through clerical errors in transcribing; allowances also have to be made when making a search of the files for the variations of measurements, as taken by different operators.

Another matter which is very important and deserves mention, is the sending of finger impressions instead of photographs with measurements, by out-of-town departments, when making inquiries relative to previous records of criminals; as not only would it result in making a larger number of identifications, but it would take only one quarter of the time required under the measuring system.

For the convenience of persons who desire to become proficient in the science of finger prints, the book has been divided into three parts, as follows:

Part I.—Finger impressions, their uses, description of the various patterns, the taking of prints, and their classification.

Part II.—Making comparisons and the filing of prints, with schedule of various classifications in their order of filing, preparing cases for court and powdering impressions.

Part III.—Questions relative to the finger print system, with their answers, and plates or illustrations showing various patterns, etc.

PART I.

PART I.

Basis of Finger Print Systems. All systems now in use for the classification of finger prints are based upon two important peculiarities of the ridges appearing on the outer joint of the fingers; the first peculiarity being their formation into various patterns, and the second the formation of two fixed points (known as cores and deltas, as explained later), together with the ridges intervening and surrounding these two points. By these two peculiarities, the primary classification, the secondary classification and, for some impressions, the final classification is determined.

Finger Impressions. The word impression as defined in the dictionary would seem to mean a mark of something, such as a stamp, mold, etc.; but as a mark of the finger would not necessarily be an impression, and would be valueless to experts unless it showed the peculiarities of the ridge formation upon which the classifications and identifications are based, the dictionary definition fails to convey the technical meaning.

The term finger print or impression, as used by experts, means the reproduction of the ridge formation on the surface of the outer or nail joint of the finger in any manner whatever; whether it be reproduced in ink, in blood, or by the greasy substance which is emitted by the sweat glands through the outlets which (as explained under outlets and ducts) are situated on the summit or top of these ridges; whether it be a photographic reproduction, or impressed in clay, wax, putty, etc., or whether it be on paper, woodwork, glass, silverware, etc. All are impressions (within the full meaning of the word) by which positive identifications can be made by experts, provided they are not smudged; for while a smudge made with the finger could be considered as a mark, it would not be an impression as referred to and used in finger print work.

Upon examination, it will be noticed that the skin on the soles of the feet and the inner surface of the hands and fingers has numerous ridges or elevations and furrows or depressions, arranged in various patterns or forms. According to Sir E. R. Henry, "physiologists are not agreed as to the uses of these ridges, or as to how they have been formed; except that perhaps their office is to raise the mouths of the ducts so as to facilitate the discharge of the sweat and also possibly to assist in some undefined way the sense of touch."

These determinations are probably true; but from personal observations, and from experience gained through the constant study of finger impressions, their uses, etc., for a number of years, I am convinced that nature provided these ridges and depressions for more important purposes than those enumerated above; such as withstanding the wear and tear to which the hands are subjected in the performance of manual labor, and the feet in walking; also as a prevention against slipping (either when walking barefooted, or when holding articles in or with the hands), by means of the suction created by such alternate ridges and depressions.

In substantiation of the additional reasons set forth for the appearance and uses of these ridges and depressions, the following conditions and things were taken into consideration and compared to the ridge surface of the hands and feet:

As the feet are subjected to a certain amount of wear and tear by reason of walking on them, and as manual labor has the same effect on the hands and fingers, it is a well known fact that if the texture of the skin on these parts were the same as that on other parts of the body, it would take no time to cause it an injury; therefore it became necessary to provide some means of offsetting and lessening the possibilities of an injury to these parts; thus nature furnishes what may be termed "corrugated skin" (corrugated meaning "anything that is pressed into alternate ridges and depressions") because it is stronger than a plain, smooth skin.

Corrugated sheet iron, cardboard, boxes, etc., are used extensively every day, for no other reason than that they are stronger and will stand more wear and tear than if they were plain. Such being the case, it is reasonable to

believe that the effect of having the skin on the hands and feet corrugated (in ridges and depressions) would be the same.

Another fact, easily proven, is that manual labor tends to increase and strengthen the development of these ridges by making them thicker and heavier, so as better to withstand the wear and tear; while in impressions of children and persons performing no actual manual labor the ridges appear more delicately defined, as shown by Figs. 3, 4 and 5. There are, of course, some exceptions to the above ridge development, as in impressions of persons employed at plaster work, cement work, dish-washing, etc. (or in fact any line of employment where the materials handled affect the skin), the ridges become temporarily destroyed, as shown by Fig. 6.

That these ridges and depressions create suction, and thereby prevent slipping (either when walking bare-footed, or when holding articles in or with the hands), may be demonstrated by comparison with rubber boots, rubber overshoes, rubber shoes for horses, bicycle tires, automobile tires, etc., all of which are provided with corrugations, or ridges and depressions in some form, for no other purpose than to prevent slipping or skidding.

Another matter deserving of being placed on record is that not only are human beings provided with these safeguards against injury, but all animals and birds are similarly equipped (either by ridges and depressions or otherwise) by nature; in fact the hands and feet of the monkey have the same ridge formations and patterns as those of human beings, and an impression of them could easily be mistaken for that of a person as shown by Figs. 1 and 2.

As to the reason for the formation of these ridges into various patterns, I am unable to advance an explanation at the present time, but no doubt that also will be satisfactorily solved in the near future.

Ridges and Depressions. Finger impressions are usually made with printer's black ink on white paper or cards, and when so made the black lines represent the ridges, while the white spaces are the depressions.

To reproduce a finger impression in print, which is often resorted to by police departments when issuing circulars for the apprehension of a criminal, it becomes necessary to have a line

cut made of the impression, by the photo-engraving process. The ridge surface of the outer joint of the fingers and the surface of the cut so made are identical in appearance, and when ink is applied to the ridge surface it adheres only to the raised portions, which accounts for the fact that the ridges are represented by black lines and the depressions by white spaces. The various enlargements and illustrations clearly show the ridges and depressions.

FIG. 1

a *b*

Fig. 1 is the finger impression of "Babe," an orang-outang, eight and a half years old; *a*, natural size; *b*, same enlarged. This pattern is a loop (see page 16, explanation of loop), showing the core and delta. (Explanation page 33.)

FIG. 2

a *b*

Fig. 2 is the finger impression of "Susie," a chimpanzee, four years old; *a*, natural size of print; *b*, enlarged. This impres-

sion is a well defined whorl, elliptical in form. (Explanation page 19.)

The impressions of the above named monkeys were taken on September 5, 1913, at the Bronx Park Zoo, with the kind permission of the New York Zoological Society.

Susie, who died recently, was known as the trick monkey, and was greatly admired by young and old who attended the public exhibitions given in the park every afternoon at 4 o'clock.

FIG. 3

a *b*

Fig. 3, a finger impression (natural size and enlarged) of a male infant, not quite six months old.

FIG. 4

a *b*

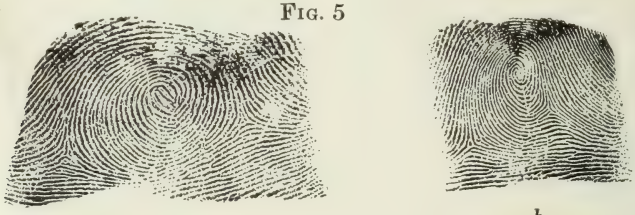
Fig. 4 shows impressions, in natural size and enlarged, of a female child, age one year, six months and nine days.

By examining Figs. 3 and 4, it will be noticed that although these impressions were taken under difficulties the ridges are quite clear and well formed; in fact, sufficiently formed to enable

an expert to make a positive identification. These impressions are reproduced to establish the fact that the ridges are visible at birth, and from experience they are known to be permanent and lasting, not only until death, but for some time thereafter, or until destroyed by decomposition. The only changes that take place in impressions of children are the enlarging of the general contour of the pattern, and consequently the enlarging of the ridges, thereby making them more clearly defined. By comparing Figs. 3 and 4 it will be noticed that even in impressions of children ridge development varies according to sex; the impression of a male child six months old (Fig. 3) showing the ridges more clearly defined than those in the impression of a female child eighteen months old (Fig. 4). The characteristic points (which will be explained later) used by finger print experts in making comparisons remain exactly the same, and a positive identification could be made after fifty years if the original impressions were preserved for comparison.

The finger print system is without doubt the best and most approved method now in use for the identification of individuals, and is not to be compared with the measuring system, which can only be relied upon after maturity, and then only partially; especially when taking into consideration the fact that of the millions of finger impressions taken since the establishment of a system whereby they are readily classified and filed, no two have as yet been found that were alike unless both impressions were of one and the same person. These identifications are made regardless of name or photograph, which cannot be said about the measuring system, as it is a common occurrence to find two persons whose measurements are exactly alike, and a photograph has to be relied upon to make the identification.

FIG. 5



a *b*

Fig. 5. These impressions are shown for comparison of the ridge development, *a* being the impression of a person employed

as a laborer, and *b* that of a person whose occupation is of a clerical nature. In the former the ridges are considerably heavier and have a coarse appearance in comparison with those of the latter impression.

Outlets or Ducts. The pores of the skin (which are not confined to the hands, but appear on the entire body) are the outlets for the sweat glands, having their termination, where ridge formations appear, on the top of these ridges, and are plainly visible in a large number of finger impressions, having the appearance of small white spots through the center of the ridges. The explanation of this is that the mouths of the outlets or ducts are depressed and do not come into contact with the ink when taking impressions. (See Figs. 14, 15, 24, 27 and 47.)

Destruction of Ridges. Figs. 6 and 7 show the effect upon the ridges in impressions of persons who handle lime, plaster, cement, etc., or of persons whose hands are continually wet. A diseased condition of the skin would have an effect upon the ridges similar to that shown in Fig. 6.

FIG. 6

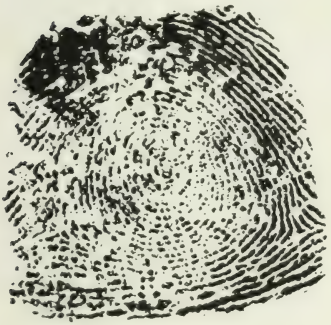
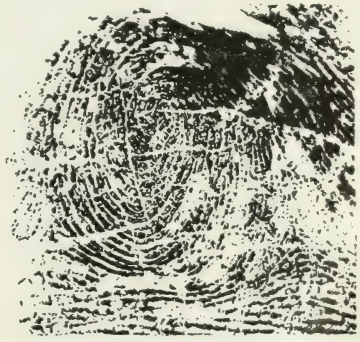


FIG. 7



Although in these impressions the ridges seem to be somewhat destroyed, it is only a temporary destruction, the ridges assuming their natural or normal condition when such person ceases that particular employment, or when the skin disease has been cured, as shown by Fig. 8, which gives the finger impressions of a woman, taken at different times, and here reproduced to substantiate the facts stated above.

a. This impression was taken November 14, 1907, when the above mentioned woman was employed as a domestic and distinctly shows a partial destruction of the ridges.

FIG. 8

a *b*

b. Shows an impression of the same finger, taken about six years later, or on October 1, 1913, when she had discontinued such employment; the partial destruction has disappeared, and the ridges are restored to their natural condition.

Warts. These are fibrous growths and are easily distinguished in impressions by the appearance of a light spot, usually encircled by a black ring. Upon examination, it will be noticed that warts do not destroy the ridges; these are simply pushed aside and encircle the wart, which accounts for the appearance of the black

FIG 9

a *b*

ring mentioned above; warts, like creases, are not permanent, and when they are removed the ridges assume their natural condition and position without even the appearance of a scar, as shown in Fig. 9.

a. This impression was taken on July 14, 1907, plainly showing a wart in the lower left hand corner of the impression.

b. Shows the same impression, taken September 9, 1913, a little over six years later, with the wart removed; the ridges had resumed their natural condition, barely leaving a mark to show where the wart had been.

Creases. These are caused by a folding of the skin, and in impressions they appear as white lines crossing the ridges, as shown in Fig. 10½. These white lines differ from those caused by a scar (the result of a cut), inasmuch as the ridges show no puckering; creases may disappear, while scars are permanent.

Ulcers. In cases where ulcerous sores attack the ridges, they are permanently destroyed; for ulcers work so deeply into the flesh as to destroy the sweat glands, which characterize the surface of the skin, not only where ridges appear but throughout the entire body, by supplying nature's oil or grease, thereby keeping the skin soft and pliable.

Burns. A burn severe enough to leave a scar will change the appearance of the skin and totally destroy the ridges. In fact, the destruction of the sweat glands from any cause whatever will change the skin surface, by leaving a scar in some form.

Scars. In all finger impressions having a scar (the result of a cut) it will be noticed that the scar has the appearance of a

FIG. 10

FIG. 10½

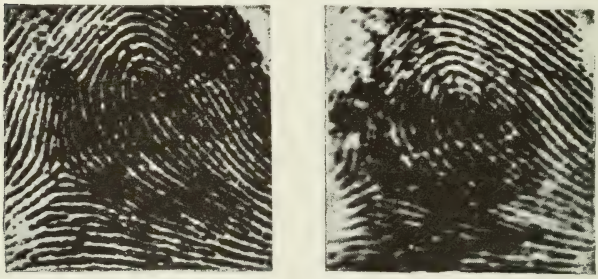
thin white line, with the ridges slightly puckered on both sides of the scar, as shown in Fig. 10.

Finger Impressions of Deceased Persons. In almost all cases impressions by which positive identifications can be made are obtainable, provided, of course, that decomposition has not set in.

In taking the impressions of drowned persons (where the body has not been in the water more than 24 hours), the finger tips must be thoroughly dried to insure the taking of ink; for oil and water do not mix, and impressions cannot be taken when the hands are wet.

Perhaps the only cases where difficulty is experienced are those of drowned persons where the body has been in the water so long that the skin on the hands and fingers becomes shriveled; but this difficulty can also be overcome, if it is absolutely necessary, by forcing embalming fluid into the arteries of the arms, until the bulbs are rounded out and the shriveled skin is restored to natural conditions. The foregoing information is authentic and can be relied upon, as it was obtained through the kindness of Mr. E. R. Lent, who was graduated from one of the largest embalming colleges in the United States, and who has had experience and practice in the embalming of bodies under all conditions for a number of years.

FIG. 11

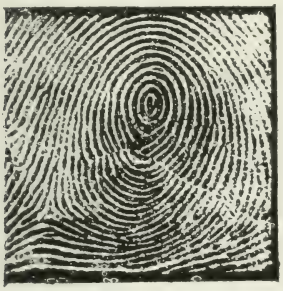


a *b*

a is an impression of a man, taken July 27, 1912, when alive, while *b* is an impression of the same man, taken at the morgue November 13, 1913, after he had been shot and killed.

a. An impression taken January 6, 1909, when the man was alive, and *b* the same impression taken at the morgue, November 25, 1913, after the body had been in the water more than twenty-four hours.

FIG. 12



a

b

In both of the cases cited above the bodies were removed to the morgue as unknown, and were identified by finger impressions taken after death.

Uses of Finger Impressions. The uses to which finger prints may be applied are really unlimited.

They are used by the police departments for the identification of persons who may have a previous criminal record, and for the apprehension of persons who have committed a crime and escaped detection, but who unconsciously left telltale impressions by having touched some article or smooth surface (such as silver ware, glass ware, china, bottles, glasses, etc.) on the premises where their crime was committed.

They are used in the Army and Navy Departments of the United States for the identification and apprehension of deserters; also for the prevention of unidentified dead on the battlefield in case of war.

A number of savings institutions use finger prints for the protection of persons who are unable to read or write; thereby preventing the withdrawal of funds from their accounts by unauthorized persons.

The finger print system could be utilized by corporations having a large number of employees, to prevent the employment

of undesirables or the re-employment of persons who were discharged at one of its branch offices, by maintaining a central bureau for finger prints at its main office and forwarding impressions of all applicants for employment at any of its branches, to the main office or central bureau for comparison.

It is a good system for the prevention of impersonation in competitive examinations, and is used at the present time by the Municipal Civil Service Commission of New York City in various examinations for positions under the Municipal Government.

It would prove a valuable means of identification if it were adopted by life insurance companies, and incidentally would prevent impersonation in medical examinations or the filing of false claims in case of death; thereby saving trouble and expense both to the company and to the beneficiary. The value of finger impressions to insurance companies can readily be realized in cases of accident where a body is mutilated beyond recognition; an impression of even one finger in a case of this kind would make a positive identification immediately, and would prevent litigation for insurance claims. These impressions could be taken by the medical examiner at the time the applicant was examined, and might be made a part of the application blank; this would remove the necessity of classifying and filing the impressions in a separate cabinet.

Finger impressions could be successfully used in lying-in hospitals, to prevent infants from becoming mixed in their identities, by taking the impressions of all infants and filing them under the mother's name; this would also prevent illegitimate children from being nameless in cases of abandonment by their mothers, which is a common occurrence in all large cities. To remove the difficulty of taking impressions of infants, a device could be used to slip over the small fingers to hold them straight while the impressions were being taken.

There is no doubt that the day is not far distant when a National Bureau of Identification will be established by the United States, compelling all residents after attaining a certain age to be finger printed. If such a bureau were established, there would no longer be cases of unidentified dead, and the criminal record of a person would be complete at all times, irrespective of the places where said criminal might have been imprisoned.

The Immigration Department could use finger impressions to good advantage in preventing persons who have been deported as undesirable from re-entering this country at some other time or port. At present there is no system in use by the government to prevent such occurrences, and almost daily persons who have been previously deported succeed in re-entering this country without detection.

The present Police Commissioner of the City of New York, the Hon. Arthur Woods, who was, during the administration of General Theodore A. Bingham as Police Commissioner, Fourth Deputy Police Commissioner in charge of the Detective Bureau and the Bureau of Criminal Identification, thoroughly investigated the value of the finger print system, and was instrumental in winning the consent of the Police Commissioner to install the system in one of the precincts in the territory known as "The Tenderloin" for the finger printing of habitual prostitutes, in order to determine how often the various women were arrested under different names, and to assist the Magistrates in imposing sentences in accordance with their records. This test extended over a period of a little more than five months, or from June 5 to November 28, 1908, and proved so successful that, at the instance of a committee known as "The Committee of Fifteen," a law was enacted by the New York State Legislature, known as the Inferior Criminal Courts Act (Chapter 659, Laws of 1910), establishing the finger print system in the night court for females and extending the use of the system to the Workhouse, as a means of identifying habitual offenders who came under the cumulative sentence act. Prior to the use of finger prints at the Workhouse there were no systems of identification in use and the authorities simply relied upon the ability of the matrons or keepers to recognize the habituals.

Recently a man who was sent to the Workhouse because of his inability to pay the fine which had been imposed, exchanged his identity, for a cash consideration, with a well known pickpocket, who had been sentenced to six months in the Workhouse; thus enabling the pickpocket immediately to gain his freedom by the payment of the other man's fine. To do away with such exchanging of identities among prisoners while *en route* to the Workhouse, a system was established whereby their finger im-

pressions are now taken at the court as soon as sentence is imposed, and these impressions are forwarded with the commitment, thereby placing the warden in a position to identify positively all persons received at his institution; and as the impressions of all persons are again taken before their release, and compared with those forwarded with the commitment, it prevents the release of persons not entitled thereto.

While this method of forwarding the impressions with the commitment is practicable, the better method would be to place them on the commitment in a space provided therefor, thus making the impressions part of the official document; furthermore, the system should not be restricted to workhouse cases only, but extended to include all cases and courts irrespective of the institution to which such persons are sentenced, as the exchanging of identities is just as likely to occur while *en route* to the Penitentiary, Sing Sing Prison, etc., as to the Workhouse.

If the Election Laws were amended so as to compel all persons to place an impression of one of their thumbs in the election register, instead of their signature as at present, this would positively prevent false registration and fraudulent voting and would entirely eliminate the so-called repeaters on election day; because all persons, even though they are unable to write their name, can make an impression which cannot be falsified or forged.

The Hon. William McAdoo, Chief Magistrate of Greater New York City, and formerly Police Commissioner, readily realized the value and advantages of finger impressions, and has now succeeded in extending the system to all Magistrates' Courts in Greater New York for the taking of impressions of persons (other than prostitutes) arrested for intoxication, vagrancy, etc.

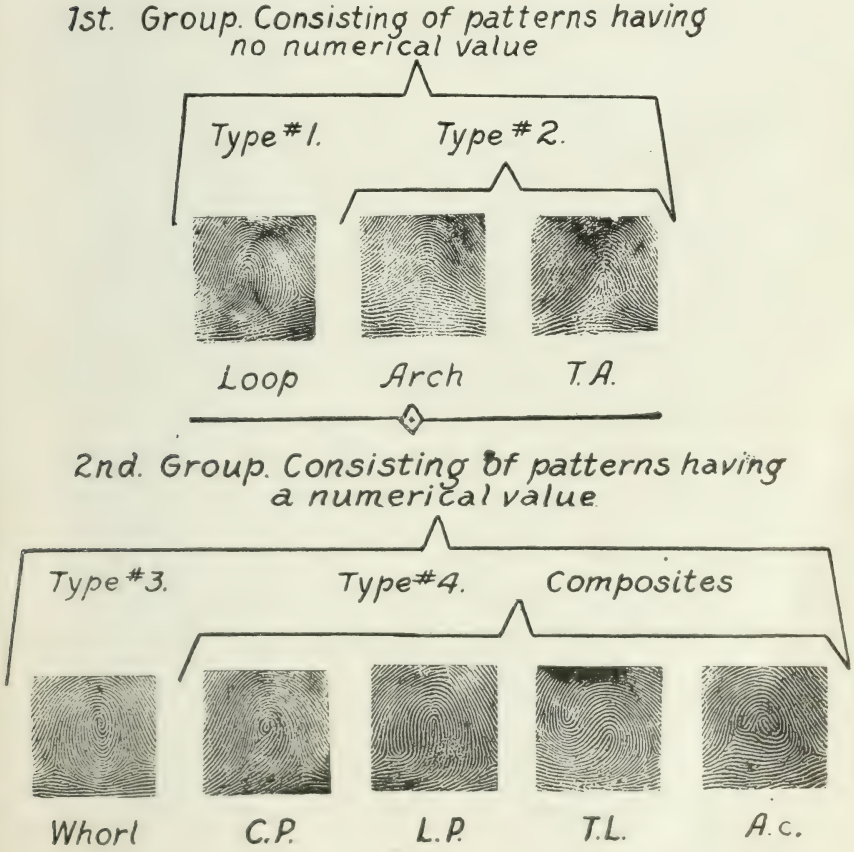
Finger impressions would be useful in institutions, asylums, etc., or in any place or business where large numbers of persons are confined or employed.

Types of Patterns. In finger print work all impressions are divisible into one of two groups, representing four types, which further represent eight distinct patterns; all of these patterns being named in accordance with the form or pattern represented therein by the ridges; namely, Loops, Arches, Tented Arches, Whorls, Central Pocket Loops, Twinned Loops, Lateral Pocket Loops and Accidentals.

The first group, which represents types 1 and 2, are the patterns to which no numerical value is assigned for the determination of the primary classification, except as explained under the heading of "Primary Classification"; as Loops and Arches, the Tented Arches being included under the type of Arches.

The second group, representing types 3 and 4, are those patterns having a numerical value assigned to them in accordance with their position in a set of prints, by which the primary classification is determined; as Whorls and Composites, the Central Pocket Loops, Twinned Loops, Lateral Pocket Loops and Accidentals being included under the general type of Composites.

FIG. 13



In the classification of finger prints, all patterns of the Composite type are treated the same as though they were true Whorls. (See Fig. 13.)

Description of Patterns in Finger Impressions. As previously stated, the various patterns used in the classification of finger prints are named in accordance with the pattern represented by the formation of the ridges, as follows:

Loops. A loop is a pattern in which one or more ridges enter on either side of the impression, and by recurving or turning pass between the core and delta (the fixed points in impressions, as explained under Classifying Prints), terminating on the same side of the impression as the ridge or ridges entered.

Although in the majority of impressions of the loop type the ridges present a series of graduated loops, or one loop surrounding the other, there are some impressions in which the loop is formed by a single recurving ridge, as shown by Figs. 16 and 17.

There are two kinds of loops, known as ulnar and radial loops, which are differentiated by the direction in which the ridges terminate. Ills. 61 to 90 are unquestionable loops; 106 to 120 inclusive are loops that resemble arches; 136 to 141 inclusive are loops that resemble tented arches; 142, 143 and 144 are loops that resemble lateral pocket loops; and 181 to 189 inclusive are loops resembling central pocket loops.

Ulnar Loops. These loops derive their name from the fact that the ridge or ridges enter and terminate in the direction of the ulnar bone of the forearm, which joins the hand on the same side as the little finger; or when the ridges of the loop slant downward from the thumb toward the little finger.

Radial Loops. These loops, like the ulnar loops, are named in accordance with the anatomy; the ridge or ridges terminating in the direction of the radius bone, which joins the hand on the same side as the thumb, and the slant of the ridges being the reverse of those of the ulnar loop; that is, the slant is from the little finger toward the thumb. The loops represented by Ills. 61, 62, 63, 67, 69, 71, 73, 75, 76, 78, 80, 82, 84, 86, 89 and 90, if appearing in the right hand would be radial loops; if appearing in the left hand would be ulnar loops, while Ills. 64, 65, 66, 68, 70, 72, 74, 77, 79, 81, 83, 85, 87 and 88 are ulnar loops in the right hand and radial loops in the left hand.

By examining the illustrations mentioned above it will be noticed that a radial loop in the right hand has the slant of the ridges in the same direction or position as an ulnar loop in the left hand, and an ulnar loop in the right hand, the same as a radial loop in the left hand; this is explained as follows: By holding both hands to the front with the palms down, so that the tips of the thumbs touch each other, it will be noticed that the thumbs and little fingers are on opposite sides of the hands, consequently the direction of the ridges in loops on one hand is just the reverse to the direction of those appearing in the other hand.

Arches. All unquestionable arches are readily distinguished by the fact that the ridges extend from one side of the impression to the other without recurving, but usually with a slight upward curve in the center, or where the curvature of the ridges has the appearance of an arch. An additional mark by which arches can be distinguished is the absence of a delta, which is known as the outer terminus of impressions and is explained under the heading of Deltas. The patterns represented in Fig. 14 and Ills. 91 to 99 inclusive are unquestionable arches.

If the appearance of a delta should present itself, it becomes necessary to determine whether one of the ridges makes a recurve, or a rounded (not angular or pointed, which is usually the result of ridge bifurcation) turn, flowing back in the direction from which it started, in which event the following rules govern the determination as to whether the pattern is to be considered as an arch or as a loop:

Where the recurving ridge forms a part of, or runs into the supposed delta, as shown in Fig. 15, it is held to be an arch, for the reason that the recurving ridge does not pass between the core and delta, thereby making ridge counting possible, but simply runs into the delta. Ills. 101, 102 and 104 are therefore arches.

If the recurving ridge passes between the delta and core, so that ridge counting is possible, even though it be a single ridge, as shown in Fig. 16, it is given the preference of a loop.

Fig. 17 shows a well defined loop, having one ridge passing between the core and delta (the dot being considered as the delta), and therefore presents no difficulty in classification.

From practical experience in the classification of finger impressions extending over a period of a number of years, I have

discovered that owing to the vague explanation given in the publications now in use there exists even among experts a difference of opinion as to whether these patterns are arches or loops, but if the foregoing rules are applied and strictly adhered to in all cases there will be no difficulty in determining the type of pattern, and differences of opinion will thus be removed.

If a doubt should exist in the mind of the person classifying impressions, it is always advisable to question this particular pattern, and if not found under the classification then to make a search of the files under the classification as questioned; this will prevent errors in the making of identifications.

FIG. 14

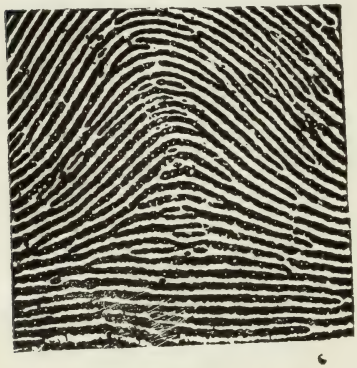


FIG. 15

FIG. 16

FIG. 17

Tented Arches. In tented arches, as in arches, the ridges run from one side to the other without recurving, but the ridges rise higher in the center, giving the pattern the appearance of a

tent, the ridge or ridges directly in the center appearing as a support, with the ridges having the appearance of the delta acting as a base. In tented arches it is not necessary that the ridges in the center rise almost to the top of the pattern; they may rise only about an eighth of an inch from the supposed delta and still be a tented arch; this is determined by the fact that the ridges in the center have the form of a tent, while in arches this tented appearance in the center is absent. The explanation given under the heading of Arches, relative to recurving ridges, is exactly the same in the case of tented arches.

Fig. 18, *a* and *b*, and Ills. 121 to 135 inclusive, are tented arches which present no difficulty.

Fig. 19, *a* and *b*, have the appearance of a tented arch but are classified as loops, because there is a ridge which recurves and passes between the core and the delta, making ridge counting possible. See also Ills. 136 to 141 inclusive, which are loops having the appearance of tented arches.

FIG. 18

a *b*

FIG. 19

a *b*

Whorls. The dictionary describes a whorl as a circle round an axis; in finger impressions whorls are the patterns in which the ridges form a series of circles or spirals around the core or axis. In some whorls the ridges immediately around the core

or axis are oval and in others almond shaped, but they become circular in form as they recede from the core or axis.

There are two classes of whorls, known as single and double cored whorls. The single cored whorls are the patterns consisting of a series of circles (Fig. 20 and Ills. 1, 12, 15, 32, 33, 46 and 47); or those appearing as a single spiral (Fig. 21 and Ills. 2, 3, 8, 10, 16, 20, 24, 25, 35, 43, 44, 49, 50, 57, 58 and 59); those termed as oval (Fig. 22 and Ills. 9, 17, 21 and 42); and the almond shaped patterns (Fig. 23 and Ills. 4, 11, 45 and 55).

The double cored are those patterns in which the ridges at the center or core have the form of a double spiral (Fig. 24 and Ills. 5, 6, 14, 18, 27, 34 and 37).

The various types of whorls are shown by Ills. 1 to 60 inclusive.

Composites. The meaning of the word composite is compound, or two or more in one. As applied to the finger print system, a combination of any two or more patterns, either of the same or different types, in one impression or print, is known as a composite; such as two loops, known as twinned loops and lateral pocket loops; or a loop and a whorl, etc., known as an accidental; or a whorl within a loop, known as a central pocket loop; all of which are included under the type of composites.

Central Pocket Loops. Are those patterns in which most of the ridges represent the pattern known as a loop, but in which one or more of the ridges within the loop, or those surrounding the core, recurve somewhat like a spiral, thereby passing between the delta (which is formed in consequence of the recurving of such ridge or ridges) and the core, so as to be at right angles to a line when drawn through the axis or line of exit of the ridges which form the loop. By the recurving of one or more of the ridges as just explained, a pocket is formed within a loop, and the impression is given the appearance of a loop containing a small whorl; this accounts for the naming of these patterns as central pocket loops. In the majority of impressions of the central pocket type, the axis or line of exit of the ridges is represented or formed by the converging of those ridges which give the pattern the appearance of belonging to the loop type. (See Figs. 25, 26, 27 and Ills. 166 to 180 inclusive.)

FIG. 20

FIG. 21

FIG. 22

FIG. 23

FIG. 24

Fig. 25

Fig. 26

Fig. 27

Fig. 28

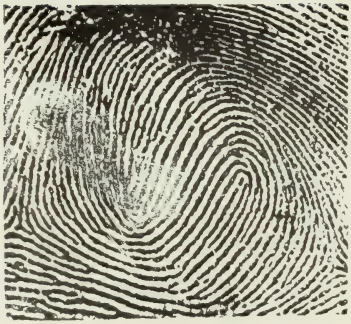


Fig. 29

Patterns having the appearance of being central pocket loops, but in which the ridge or ridges do not recurve so as to be at right angles to a line drawn through the axis, are to be classified as loops, and not under the numerical value of whorls. See Ills. 181 to 189 inclusive. There will be no difficulty in determining whether the pattern is to be classified as a central pocket loop or as a regular loop, if it is borne in mind that the recurving ridge or ridges referred to must in all cases be circular and not angular in form if the pattern is to be considered as a central pocket loop; bifurcations are not recurving ridges. In Fig. 30, *a*, *b*, c, and *d* show the recurving ridge, and when this appears in finger impressions they are classed as central pocket loops; *e*, *f*, *g* and *h* show the ridges to be angular, and are thus classed as loops and not as central pocket loops.

FIG. 30

Twinned Loops. These patterns are so named because they present two distinct loops, one surrounding or overlapping the other, and having the termination or outlet of the ridges immediately around the core of each loop, separated by, or on opposite sides of, either delta.

Although Sir E. R. Henry in his description of twinned loops says "where the ridges containing the points of core have their

exits on different sides of the right delta," I maintain that if the terminals are on the same side of the right delta, but separated by the left delta, it is a twinned loop, just the same as when they are separated by, or on opposite sides of the right delta; because in either case there are two distinct and separate loops. (See Figs. 31, 32, 33, 36 and Ills. 151 to 165 inclusive.)

In Fig. 31 and Ills. 151, 153, 155, 157, 159, 161 and 163 the terminals are separated by the left delta; while in Figs. 32, 33, and Ills. 152, 154, 156, 158, 160, 162, 164 and 165 they are separated by the right delta.

Lateral Pocket Loops. Are patterns in which the ridges have the appearance of being two loops, one surrounding or overlapping the other, and to the inexperienced person they would seem to be twinned loops; but upon examination of the print it will be noticed that lateral pocket loops differ from twinned loops, because the ridges about the core of each loop terminate on the same side of the delta, and not on opposite sides as in twinned loops.

Ills. 145 and 149 show the ridges terminating between the two deltas; in Fig. 28 and Ills. 146, 147 and 150 they terminate to the right of the right delta, while in Fig. 29 (which is an enlargement of Ill. 148) the ridges terminate to the left of the left delta.

Fig. 36 is a diagram showing the difference between the terminal endings of twinned and lateral pocket loops; *b* and *g* being twinned loops in accordance with Sir E. R. Henry's explanation, but as *a* and *h* are the reverse of *b* and *g*, I see no reason why they too should not be classed as twinned loops, even though the terminals are separated by the left delta; therefore *a*, *b*, *g* and *h* represent the terminals of twinned loops, and *c*, *d*, *e*, *f*, *i*, *j*, *k* and *l* those of lateral pocket loops.

Accidentals. These are patterns which seem to be formed by accident, and in which the formation of the ridges usually presents two different and distinct patterns of the other types (such as a loop encircling a whorl, or a whorl resting on the apex of a tented arch and giving the whorl the appearance of having collapsed), and they are therefore of the true composite type, and within the meaning of all that the definition of composite implies.

Fig. 31

Fig. 32

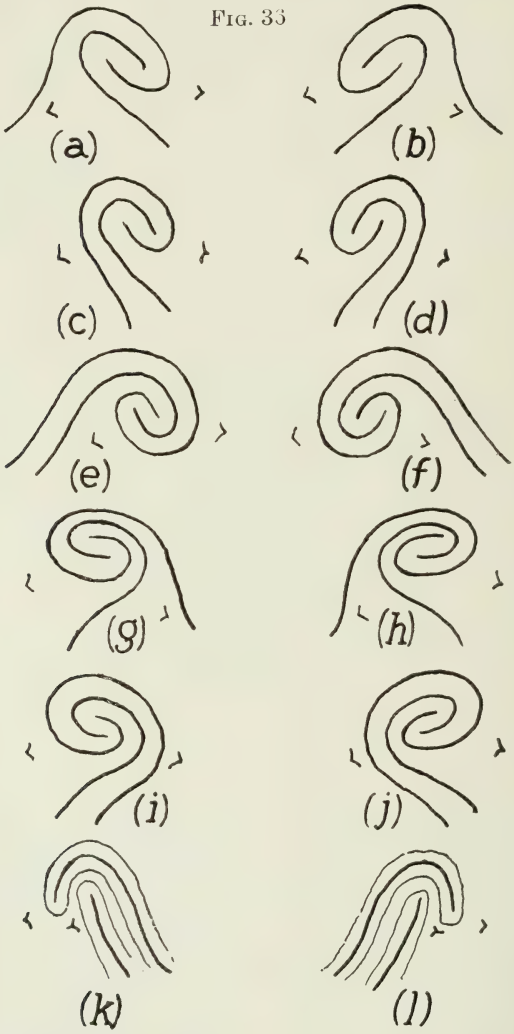
Fig. 33

Fig. 34

Fig. 35

These patterns, accidental in formation and few in number, may not properly be classed under the other types (loops, arches and whorls), so for want of a better name they are termed

Fig. 33



accidentals, and are given the same numerical value as whorls and other composites in determining the primary classification of impressions in which they occur.

Percentage of Various Types of Patterns. In all collections of impressions (whether they are large or small collections), loops are in the majority, representing approximately sixty per cent of all types of patterns, while thirty-five per cent are whorls (including composites), and five per cent are arches (including tented arches).

Figs. 34 and 35 and Ills. 190 to 195 inclusive are of the accidental type.

TAKING FINGER IMPRESSIONS.

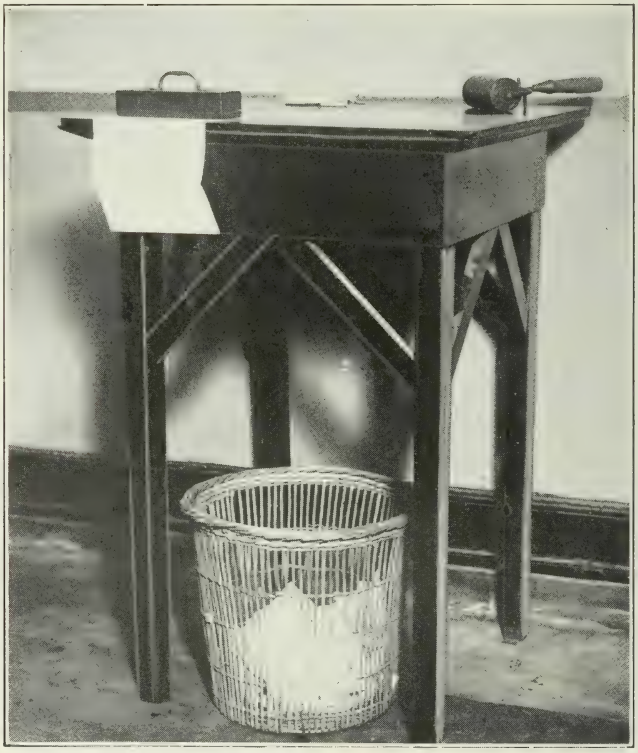
Articles Required. The articles required for the taking and classifying of finger prints are neither extensive nor costly, and consist of the following:

A *table,* about four feet high, with a square top of convenient size having the edges square and sharp; the under surface of the edges may be beveled, but this is not necessary; a *slab* made of plate glass or of any smooth metal, upon which to spread a thin film of ink (a piece of plate glass covering the entire table top is the most convenient); a *roller* (of a size to suit the requirements, such as is used by printers as a proof roller, being a composition of glue and molasses), for rolling out, or distributing the ink on the slab; *printing ink* (known as job black), of any good brand; *benzine* (to remove the ink from slab when not in use, as a clean slab is an important factor if good impressions are desired); *blank forms* or *cards* (white), ruled to receive a rolled impression of the ten fingers individually and plain impressions of the index, middle, ring and little fingers of both hands simultaneously; a *pointer*—anything pointed will answer the purpose, such as a long hat pin, a crochet needle, or an ordinary needle driven into a penholder or similar piece of wood—for counting and tracing the ridges of impressions when classifying; a *magnifying* or *reading glass,* for use when tracing or counting ridges, or when making comparisons of ridge characteristics. Although any magnifying glass will serve the purpose, the style known as a linen tester (having an opening one inch square, with a fixed focus, and which can be folded and carried in the pocket when necessary) is the most convenient for two reasons: It gives the expert a free use of both hands at all times, as it does not have to be held because it has a base with an opening, which is placed over the print to be examined; and it relieves the strain on the eyes, by reason of being steady and in focus, which is not the case when

using the style of magnifying glass which has to be held and focused, and to which the hand communicates its own nervous tremor.

In addition to possessing the good features of the linen tester or folding glass, the "Dactyloscope," a recent invention by Dr. Henry P. de Forest, of the Municipal Civil Service Commission of New York City, is provided with a high power lens for enlarging any part of an impression which might be indistinct, and with a pointer for counting ridges, so arranged that it can be moved along a very fine wire stretched across the opening in the base, which serves as the imaginary line referred to under the heading of ridge counting, thus insuring accuracy in such count.

FIG. 37

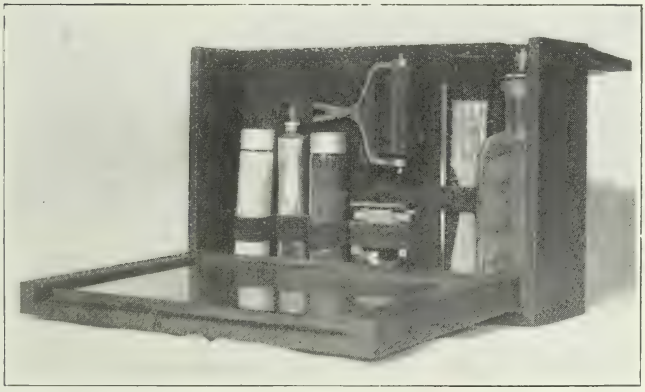


The finger print table shown in Fig. 37 is in accordance with the description previously given, the entire top being covered with a slab of plate glass.

Fig. 38 shows a handy and compact finger print outfit for use in small towns, or for taking or powdering finger impressions when called on outside cases. The case is leather covered, cloth lined, with nickel plated trimmings, and contains the following articles: a four ounce bottle with sprinkler top for benzine; a one inch

FIG. 38

a



b

camel's hair brush, a nickel plated steel pointer, a two inch printer's roller, a folding magnifying glass (linen tester), a tube of printer's ink, one vial each of black and white powder, a plate glass slab (five by eight inches), and a cloth to clean the hands and the slab.

The case when closed is neat in appearance (resembling a kodak case), is handy to carry, and measures nine and five eighths inches long, six and five eighths inches high and two and five eighths inches thick.

Mode of Taking Impressions. After spreading a thin coat or film of ink (which has been previously rolled out and evenly distributed) on the edge of the slab, the operator takes his position to the left of the subject to be finger-printed; then, taking the right hand of the subject, he places the outer joint of the thumb (the fingers not in use being closed or folded under) on the edge of the slab, so that the right side of the nail is at right angles with the slab; he then rolls said joint on the slab toward himself, until the left side of the nail is at right angles with the slab. (See Fig. 39.)

FIG. 39

The finger now being properly inked for a rolled impression, it is placed on the finger print blank by the same mode of procedure as for inking; the index, middle, ring and little fingers are then inked, each individually in the order mentioned and in the

manner as described for the thumb, and the impression is placed on the blank form as each finger is inked.

The impressions of the left hand are taken in the same manner as for the right hand, except that the operator now takes his position to the right of the subject and places the outer joint of the finger so that the left side of the nail is at right angles, rolling the finger toward himself as before, until the right side of the nail is again at right angles, as shown in Fig. 40.

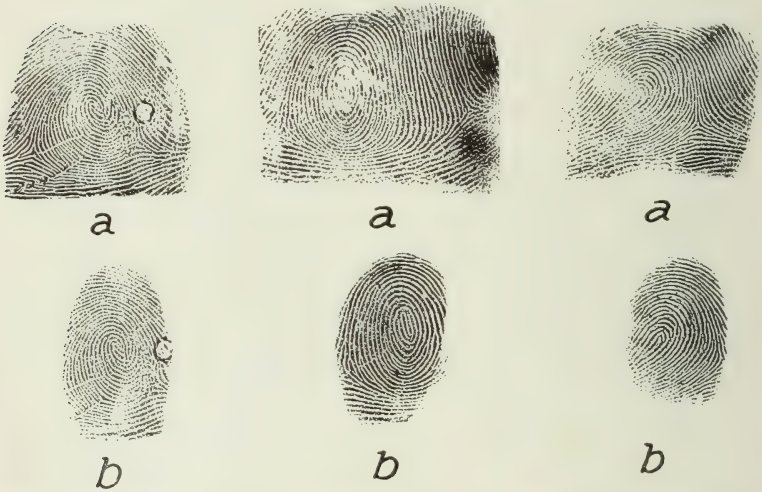
FIG. 40

Rolled Impressions. The impressions just described are known as rolled impressions (Fig. 41, *a-a-a*), and are taken for the purpose of showing the entire ridge surface of the outer joint of the fingers from one side of the nail to the other, thereby enabling the finger print expert readily to determine the pattern represented in such impression and properly to classify the same, and incidentally giving a larger number of characteristic points for making comparisons. If rolled impressions were not taken the majority of impressions would show the deltas to be absent, and twinned and lateral pocket loops in some instances would have the appearance of being a single loop, owing to the absence

of the recurving ridge or ridges of one of the loops; consequently the proper classification of impressions would be rendered impossible by the absence of these important guiding points.

Plain Impressions. After the rolled impressions have been taken, the outer joints of the index, middle, ring and little fingers of both hands are again inked on the slab (but not rolled) and simultaneously impressed in the spaces provided therefor at the bottom of the blank form; some forms also provide for a simultaneous impression of both thumbs, although this is not absolutely necessary according to the Henry system; but as experience (which is the best teacher) has proven that a check upon the position of the thumbs is very important and, in fact, a necessity when classifying finger prints in which the hands are transposed and in which one of the thumbs is represented by a pattern hav-

FIG. 41



ing no graduated value assigned for the primary classification, such as a loop, an arch, or a tented arch, and the other thumb by a pattern of the whorl or composite type, I would advise the taking of a simultaneous print of both thumbs, by placing them together (side by side) and impressing them either in the space between the simultaneous impressions of both hands, or in a space provided therefor. These are known as plain impressions and are used as a means of checking the position of the rolled impressions, there-

by preventing errors in classifying in the event that the rolled impressions had been misplaced by the operator when taking such impressions.

In explaining the uses of plain impressions, Sir E. R. Henry evidently overlooked the fact that in addition to acting as a check upon the position of the rolled impressions, they serve as an aid in determining the type of pattern when a rolled impression is blurred or indistinct, or if the pattern is a doubtful or questionable one, because invariably the plain impressions show the ridges more clearly defined; they are also used for making comparisons with the impressions left at the scene of a crime, because impressions left under such conditions are always plain impressions. (See Fig. 41 *b-b-b*.)

a-a-a represent rolled impressions, and *b-b-b* the corresponding plain impressions.

Classifying Prints. The classification of finger impressions is one of the most important subjects in the finger print system, and for the convenience of students it will be dealt with under various headings, such as cores and deltas, ridge counting, ridge tracing, etc. To properly classify finger prints, it is very important to know and understand the meaning of core and delta (as referred to under the heading of Description of Various Patterns), and the purpose they serve.

Cores and Deltas. The core and delta are defined as the fixed points of an impression, and make their appearance only in such patterns as loops, whorls and composites (neither of them appearing in arches or tented arches); the core is the inner terminus or central point of the pattern, and the delta is the outer terminus. ~ bordered

The *core* is a very important consideration in loops, but is seldom referred to in the classification of whorls or composites. In loops it serves as the starting point for the counting of ridges intervening between such point and the delta. The inner ridges of a loop may consist of a single loop, a single ridge in the center of a loop, or a number of ridge terminations within a loop either even or uneven in number as shown in Fig. 42.

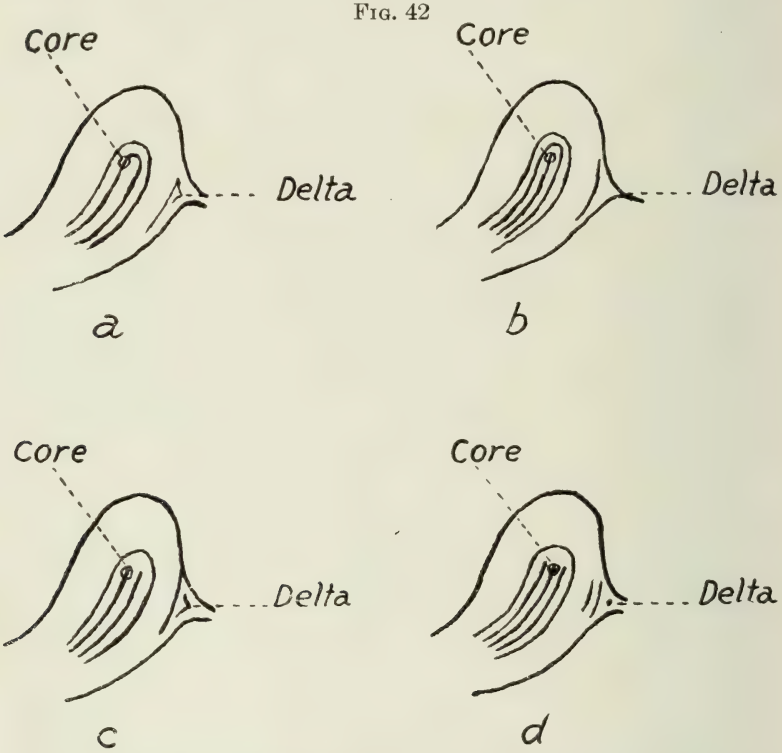
Where a single loop appears, the ridge of said loop farthest from the delta is used as the inner terminus or core, at a point near the top, just before recurving, as represented by *a*, Fig. 42.

If the center consists of a single ridge, the top of this ridge is taken as the core; *b*, Fig. 42.

When two ridges appear as shown by *c*, Fig. 42, the top of the ridge farthest from the delta is used as the core.

In patterns showing an even number of ridge terminations within a loop, the two ridges in the center are singled out and the one farthest from the delta is used as the core, the same as explained above for two ridges.

FIG. 42



In cases where the center of a loop consists of an uneven number of ridges as shown by *d* in Fig. 42, the center ridge becomes the core.

In all patterns known as whorls and composites the central point or points are considered as the inner terminus or core; some being single cored (Figs. 20, 21, 22, and 23), and others double cored (Figs. 24, 28, 29, 31, 32 and 33).

The *delta*, which is taken as the outer terminus, is so named because it is really the outer termination of all patterns in which it appears, there being no pattern formed by the ridges outside of this point or points; it also derives its name of delta from the fact that in the majority of finger impressions its shape closely resembles the Greek letter D, which is triangular in form and is known in Greek as *delta*. With deltas it is the same as with cores; they are important fixed points in both loops and whorls; loops having one delta, while whorls have two and composites two or more, used as a guide in tracing the ridges to determine whether the whorl or composite is an inner, meet or outer, as explained under the heading of Ridge Tracing.

According to Sir E. R. Henry the delta is formed in one of two ways: "Either (*a*) by the bifurcation of a single ridge, or (*b*) by the abrupt divergence of two ridges that hitherto had run side by side." In the first instance he is correct, because the point of bifurcation in such cases is considered as the outer terminus (Fig. 42*b*); but in the second instance he is in error, because in accordance with his own statement that "the nearest ridge in front of the place where the divergence begins, even if it be a mere point, and whether it is independent of or sprung from the diverging ridges or not, it is the outer terminus," the two ridges referred to neither form the delta, nor are they taken into consideration as forming a part thereof, except when the delta is represented either by a dot, by a short ridge or by a ridge which ends abruptly (Fig. 42 *a-c-d*), and then only when appearing in whorls or composites where ridge tracing is resorted to, as explained under the heading of "Ridge Tracing" for the tracing of ridges which end abruptly.

Sir E. R. Henry when he wrote his book on the classification of finger prints, probably intended to infer, that in consequence of the abrupt divergence of these two ridges, a delta in some form made its appearance. I therefore contend that the delta varies in patterns and is formed in a number of ways. It may be formed by a ridge line abruptly deviating or changing its course, as in Fig. 42*a*; it may be caused by a ridge line bifurcating or separating into two ridges, thereby forming what might be termed the letter Y, as shown in Fig. 42*b*, and if there should be several bifurcations, one behind the other, the bifurcation nearest the

core or central point of the pattern is to be considered; it may be represented by two short ridge lines forming the letter V, Fig. 42*c*, or it may appear as a dot or short ridge line between or in front of two ridges running parallel and then separating; one running up and the other down, as in Fig. 42*d*.

While in Fig. 42*d* the delta is shown as a dot, it must be remembered that, if the dot was absent, the ridge immediately in front of the opening caused by the ridges separating would be considered as the delta, without regard to the length of such ridge.

Ridge Counting. Loops are the only patterns in which ridge counting is resorted to, and this is done when loops appear in the index finger of either or both hands or in the index and middle finger of either or both hands, to determine whether they are inner (I) or outer (O) loops, when used in connection with whorls, for the secondary classification, or for the second subclassification when loops appear in both index fingers, in addition to the capital letters R and U, which denote the kind of loop appearing in the fulcrum or index fingers. If an arch or tented arch should appear in one index with a loop in the other, ridge counting is dispensed with.

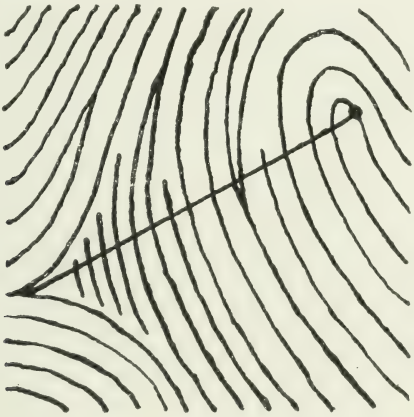
In the fulcrum or index fingers, any number of ridges from one to nine inclusive is termed an inner, and ten ridges or over an outer; while in the middle fingers any number of ridges up to and including ten is allowed for an inner and eleven or more for an outer; in this count the inner and the outer terminus are both excluded.

Ridge counting is also resorted to, when a loop appears in the right little finger, for the purpose of determining the final classification, which is represented by the numeral or numerals corresponding to the number of ridges appearing in said loop; therefore, an impression having the number 13 as the final classification indicates that there are 13 ridges intervening between the core and the delta of the loop appearing in the right little finger.

As it is an important point to be remembered, mention is again made of the fact that in ridge counting neither the core or inner terminus nor the delta or outer terminus is to be included in such count, but all ridges or terminated ridges which intervene or pass between the core and delta, that would cross

or touch an imaginary line running from said core to delta, are to be considered and counted; in cases of ridge bifurcation where the point of bifurcation is so situated that the imaginary line would cross said point, they are considered and held to be two distinct ridges and to be counted as such. Fig. 43, which is a sketch of an enlarged loop, has the imaginary line drawn from the core to the delta to show the terminated ridges and bifurcations which either cross or touch the same, and has a count of fifteen ridges between the two terminal points. By frequently examining this sketch, no difficulty will be experienced in ridge counting.

Fig. 43

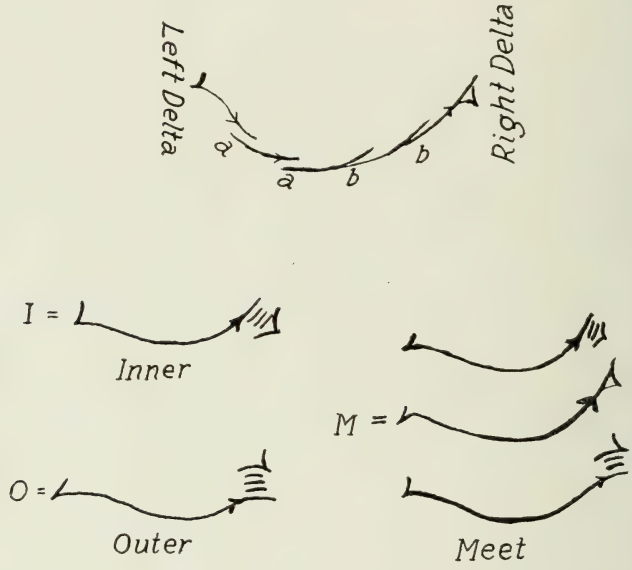


Ridge Tracing. The tracing of ridges is only used when whorls or composites (which are classed with whorls) appear in the index finger of either or both hands, or in the index and middle fingers of either or both, for the purpose of determining whether they are inner (I), meet (M), or outer (O) whorls, and is used as the sub-classification, or to sub-divide the primary classification, being always represented by the capital letters I, M, or O as the case may be.

The ridges of whorls and composites are traced by starting at the delta on the left side and following the ridge emanating therefrom by moving in the direction of the delta on the right side, care being taken not to lose sight of the ridge which is being traced, as an accidental jump to the ridge next above or to the

one next below (unless there is an abrupt ending or bifurcation of the ridge being traced, as explained below) is apt to falsify the entire classification, thereby rendering the impression useless for future identification. If the ridge so traced should terminate or end abruptly, the course of the next ridge below is pursued, or if the ridge should bifurcate the course of the lower branch of said bifurcation is taken as shown in Fig. 44, where *a-a* represent ridge terminations or abrupt endings, and *b-b* bifurcations.

FIG. 44



Ridges which seem to be disconnected, or having breaks which may be caused by a temporary ridge destruction or by a speck of dirt on the inked slab, thereby preventing the ink from adhering to the ridge at this particular point, are not abrupt endings or terminations as referred to under ridge tracing; they are to be ignored and the ridge traced as though these breaks were absent and the ridge continuous.

When more than two deltas appear, as in some composites, the deltas on the extreme right and left are used in tracing, no consideration being given to those appearing between them.

By following the directions given for the tracing of ridges, you will perceive that the ridge so traced may pass inside, or meet, or pass outside of the right delta. If passing on the inside, with three or more ridges intervening between the ridge being traced and the delta, it is classified as an inner whorl as shown in Fig. 44 (I); if it should exactly meet the right delta, or not more than two ridges intervene when passing either on the inside or outside of the delta, as in Fig. 44 (M), it is known as a meet whorl; and with three or more ridges intervening when passing on the outside (as explained above for inner whorls), it is termed an outer whorl; see Fig. 44 (O).

By examining the sketches of inner, meet and outer whorls in Fig. 44, it will readily be noticed that an allowance of two ridges inside and two ridges outside of the right delta has been made for meet (M) whorls, owing to the fact that there are very few whorls where the ridge emanating from the left hand delta exactly meets the right hand delta; consequently, to prevent overcrowding the collection of inner and outer whorls, and to distribute them more evenly into inners, meets and outers, it has been found necessary to allow these additional ridges in the cases of meet whorls.

Signs or Symbols Used. After having become proficient in determining the type or class of the various patterns, and having become familiar with the rules for the tracing and counting of ridges, the student is prepared to advance to the actual classification of impressions, by placing under each impression the sign or letter used to represent the pattern shown therein, as follows:

Loops are represented by a line, slanting in the same direction as the ridges in the loop; thus \ represents an ulnar loop in the right hand or a radial loop in the left; / represents a radial loop in the right hand or an ulnar in the left.

Arches and tented arches are represented by the letters A (for arches) and T (for tented arches), the capital letters being used only when such arch or tented arch appears in either of the index fingers; when appearing in any other finger of either hand, it is represented by the small letters *a* or *t*.

The letter *w* denotes that the impression is either a whorl, or a pattern which is classed under whorls and having the same numerical value; in this case the small letter is used at all times.

Composites are also marked with the letter *w* for the reason that they are classed under whorls and have the same value numerically; the additional letters T. L. for twinned loops, L. P. for lateral pocket loops, C. P. for central pocket loops, and Ac. for accidentals, may be added thereto to show the type of composite therein represented; although in actual practice this is not done, as it is considered a waste of time and of no actual value in the classification of prints.

The following symbols, given by Sir E. R. Henry, I have omitted for the reason that they are never used in classifying and are superfluous: L for loops, C for composites, I. T. for inner terminus and O. T. for outer terminus.

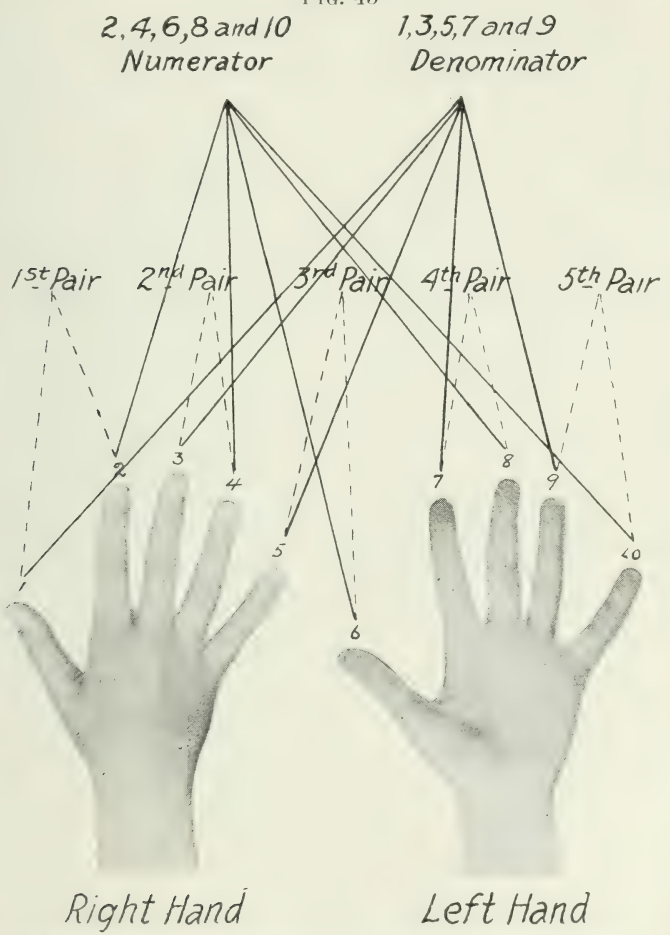
In addition to the signs given above, the capital letters I, M, and O are used in the sub-classification; I representing inner loops or whorls, M representing meet whorls, and O representing outer loops or whorls.

Numerical Value of Patterns. Loops, arches and tented arches have no numerical value individually; but when taken collectively, for sets of impressions in which no whorls or composites appear, a fixed primary classification is assigned as explained under the heading of Primary Classification; while for whorls and composites (central pocket loops, twinned loops, lateral pocket loops and accidentals), the individual values of 16, 8, 4, 2 and 1 are assigned, the primary classification depending entirely upon the values considered, as they are graduated and vary in accordance with the finger or fingers in which a pattern of the whorl or composite type appears.

Assignment of Numerical Values. For the purpose of utilizing the numerical values assigned to patterns of the second or numerical group (loops, arches and tented arches not being considered), the impressions of both hands are divided into pairs and the values assigned as follows: *first pair*, the right thumb and right index finger, with a value of 16 for each; *second pair*, the right middle and right ring fingers, with a value of 8 for each; *third pair*, the right little finger and left thumb, with a value of 4 for each; *fourth pair*, the left index and left middle fingers, with a value of 2 for each; and the *fifth pair*, left ring and left little fingers with a value of 1 for each. See Fig. 45.

Primary Classification. The primary classification of a set of impressions is the first or main part of the classification, as it determines the file under which the print is placed or filed, and it is always represented or expressed by numerals in the

FIG. 45



form of a fraction, the upper numeral being the numerator and the lower the denominator, as $\frac{1}{1}$, $\frac{5}{17}$, $\frac{11}{24}$, $\frac{32}{32}$, etc.

To a set of prints (ten fingers) consisting wholly of patterns to which no individual numerical value has been assigned (first

group), the fixed primary classification of $\frac{1}{1}$ is always given; while for prints consisting wholly or partially of patterns with a numerical value (second group), the primary classification is determined as explained below.

These fractions or primary classifications (except the primary classification $\frac{1}{1}$) are the result obtained by the addition of the numerical values which are assigned to patterns of the second group (whorls and composites), in accordance with the position which these patterns occupy, when appearing in a set of finger impressions, the first of each pair (right thumb, right middle, right little, left index and left ring fingers), or the 1st, 3rd, 5th, 7th and 9th fingers governing the result for the denominator and the second of each pair (right index, right ring, left thumb, left middle and left little fingers), or the 2nd, 4th, 6th, 8th and 10th fingers governing the result for the numerator, as shown in Fig. 45; an additional value of 1 being added to the results obtained by the addition of these values, for both the numerator and the denominator, thereby accounting for the fixed primary classification of $\frac{1}{1}$ which (as previously explained) is borrowed and assigned to impressions consisting wholly of patterns of the first group, or to impressions in which no whorls or composites (second group) appear in either of the ten fingers or digits.

EXAMPLE.

Right hand	w	\	w	\	w				
Left hand	w	w	/	w	/	=	$\frac{5}{32}$		

	1st pair	2nd pair	3rd pair	4th pair	5th pair					
Numerator....	L	L	W	L	L	$\frac{4}{31}$	+	$\frac{1}{1}$	=	$\frac{5}{32}$
Denominator..	W	W	W	W	W					

The first part of the example shows the signs used under each impression, while the second part shows them arranged in pairs, the first of each pair expressing the denominator and the second of each pair the numerator.

By applying the rule given for the assignment of numerical values to the above example, we have the following result. Numerator: No whorl appearing in the 1st, 2nd, 4th or 5th pair, there is no count; a whorl appearing in the 3rd pair has a count of 4 plus the 1, equaling 5, the result for the numerator. Denominator: A whorl being represented in each pair, we have the total of 16, 8, 4, 2, and 1, which equals 31 plus 1, making the result for the denominator 32. The above will serve as an example for determining the primary classification of all impressions, whether composed of loops, arches or tented arches, as all are classed as loops in the primary classification; while whorls, and composites (which consist of central pocket, lateral pocket, twin loops and accidentals), are classed as whorls.

Why is the Numeral One (1) Used for Both Numerator and Denominator in Impressions Having No Whorls? This question is often asked (especially in examinations for the position of finger print expert), and very few persons seem to be able to give a good and sufficient reason, owing to their inability to comprehend the complex explanation given in the book entitled "Classification and Uses of Finger Prints." A simple and concise answer to the question would be, that it is used so as to provide a compartment in the filing cabinet, under a numerical value, the same as for other impressions.

In giving the following detailed explanation to the above question, an endeavor has been made to show the cause of such assignment: When finger prints were first adopted by the English Government, the system of classifying and filing their collection under numerical values had not occurred to them, but instead it was filed in a cabinet consisting of 32 vertical compartments and 32 horizontal compartments, or a total of 1024 single compartments, as shown in Fig. 46, in accordance with a key which represented the two classes of patterns (namely, loops and whorls), and determined the compartment in which the various impressions were to be filed.

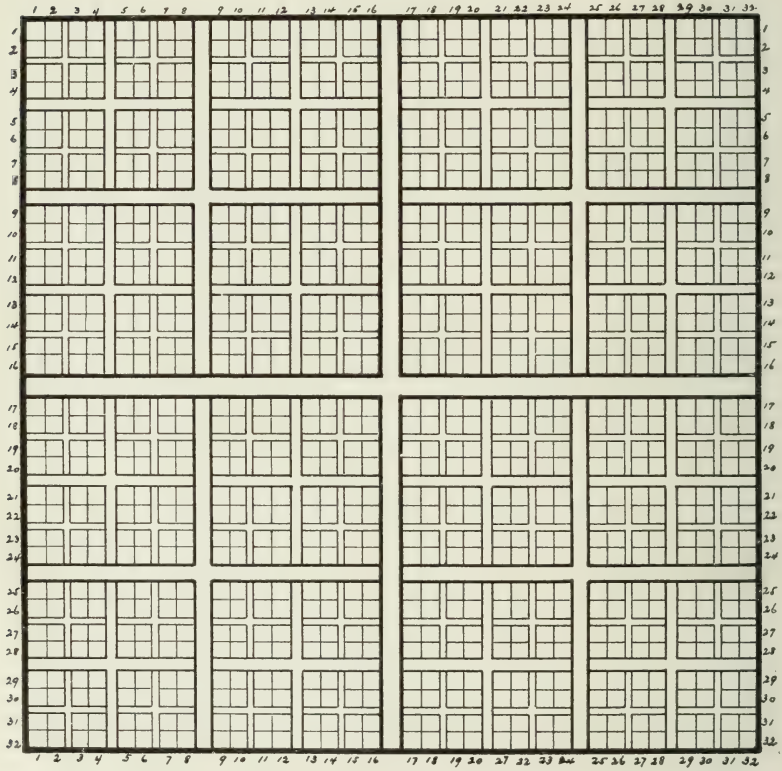
This key consisted of a square divided into four smaller squares, with the letters LL in the upper left hand square, LW in the upper right hand square, WL in the lower left hand square and WW in the lower right hand square, as follows:

Key.

LL	LW
WL	WW

Fig. 46, which represents an outline of the filing cabinet, shows how the cabinet was sub-divided to correspond with the sub-divisions of the key and how each sub-division of the cabinet

FIG. 46



corresponded to the manner in which finger impressions were divided into pairs, as explained under the classification of impressions.

Being a square, the first pair governed the division of the cabinet into 4 smaller squares of 256 individual compartments each (1/4 of 1024=256), or 16 compartments each way; the second pair sub-divided each of these 4 squares into 4 smaller ones, giving 16 sub-divisions of 64 compartments each (1/16 of 1024=64; 1/4 of 256=64), or 8 each way; the third pair, sub-dividing each of these 16 squares, gave the result of 64 sub-divisions or squares of 16 compartments each (1/64 of 1024=16; 1/16 of 256=16; 1/4 of 64=16), or 4 each way; each of these 64 squares being divided into 4 for the fourth pair, resulted in giving 256 sub-divisions of 4 compartments each (1/256 of 1024=4; 1/64 of 256=4; 1/16 of 64=4; 1/4 of 16=4), or 2 each way; and the last or fifth pair governed the division of each of the 256 squares into 4, giving 1024 individual sub-divisions or compartments, in a square of 32 each way.

When applying the key for the cabinet to impressions having no whorls, the following result is obtained by the arrangement of pairs, arches and tented arches being designated by the letter L the same as for loops, as they belong to the group having no numerical value of their own:

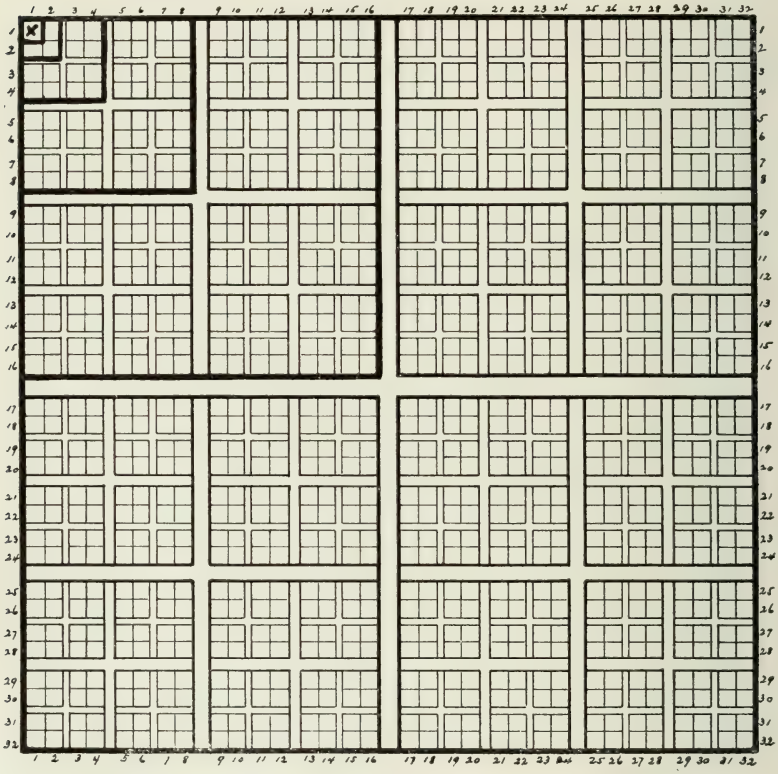
$$\begin{array}{|c|c|c|c|c|} \hline \mathrm{L} & \mathrm{L} & \mathrm{L} & \mathrm{L} & \mathrm{L} \\ \hline \mathrm{L} & \mathrm{L} & \mathrm{L} & \mathrm{L} & \mathrm{L} \\ \hline \end{array}$$

By this formula we have five pairs, each being represented as LL, and according to the key, LL represents the upper left hand square; by considering the pairs individually, the first pair takes its place in the upper left hand square of the cabinet, containing 16 compartments each way, or a total of 256; the second pair again takes its place in the upper left hand square of this square, giving the section with 64 compartments; the third pair being the same, takes its place in the section having 16 compartments; the fourth pair is assigned to the section having 4 compartments, and the fifth pair to the last compartment in the upper left hand corner of the cabinet, or compartment 1 vertical (numerator) and 1 horizontal (denominator), as shown in Fig. 46*a*, where the heavy black lines show the division as each pair is applied.

After thousands of impressions had been filed by the use of the key, the idea occurred to them that by numbering the com-

partments of the filing cabinet from 1 to 32 along the top and bottom, and from 1 to 32 along both sides, and assigning a numerical value to the whorls appearing in a set of prints, for a primary classification, it would abolish the use of the key, simplify the filing of prints and place them in the compartment corresponding to the numerals represented by such primary classification.

FIG. 46*a*



In determining the values to be assigned, the following method was adopted: Each finger having two variations (one for L and one for W), it proved (through the use of the key) that each hand had 32 variations, and by taking half it gave 16 for the first value, half of 16 gave 8 for the second value, half of 8 gave 4 for the third value, half of 4 gave 2 for the fourth value and

half of 2 gave 1 for the fifth value, but as the result in addition of 16, 8, 4, 2 and 1 was only 31 for impressions having all whorls and these impressions occupied the compartment 32 vertical and 32 horizontal, they concluded to add the value of 1 to both numerator and denominator, to provide a numerical value for impressions having no whorls to correspond to the compartment which such impressions already occupied, as the result of filing by the use of the key; thus the value of 1 was given as the numerator and the denominator, and the impressions filed under the primary classification $\frac{1}{1}$, the numerator representing the vertical file and the denominator the horizontal file.

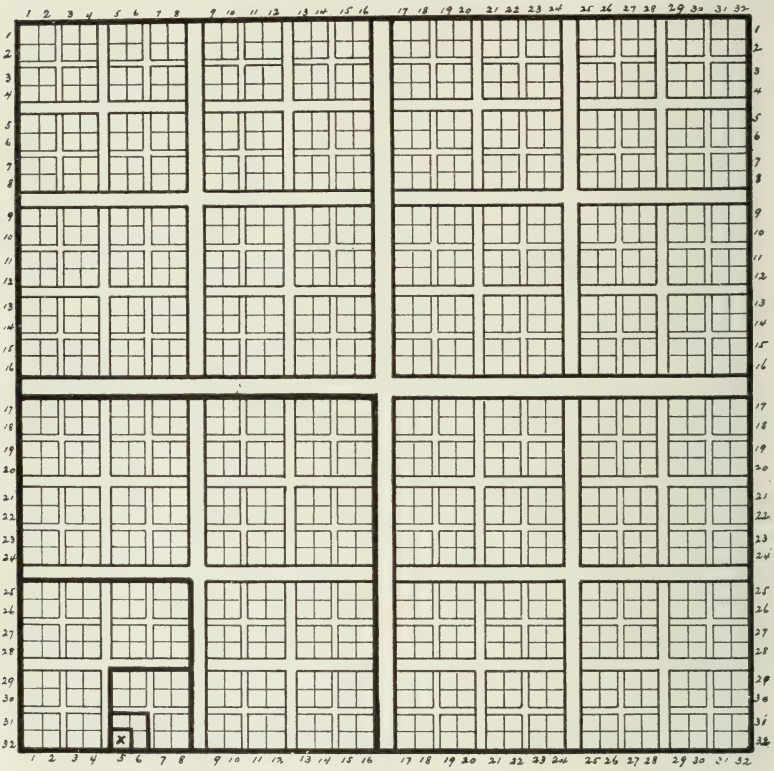
The same rule applies to all primary classifications, $\frac{5}{17}$ representing the fifth vertical file or compartment and the seventeenth horizontal compartment, and $\frac{32}{32}$ would thus fall in the compartment in the extreme lower right hand corner of the cabinet, or diagonally opposite to the $\frac{1}{1}$ prints.

Inverting the Primary Classification. Under the heading of "Primary Classification" there is no mention made of inverting the primary classification (as described under the Henry system), because it is an unnecessary loss of time to record the primary classification as $\frac{32}{5}$, and then invert it, so as to appear as $\frac{5}{32}$; this useless inversion was in reality never practised by finger print experts, except perhaps in England, and even there it has been dispensed with.

This inversion was caused in writing the formula of a print, by expressing the first of each pair as the numerator and the second of each pair as the denominator, in the following manner, $\frac{\text{W} \mid \text{W} \mid \text{W} \mid \text{W} \mid \text{W}}{\text{L} \mid \text{L} \mid \text{W} \mid \text{L} \mid \text{L}}$, to comply with the use of the key previously explained, and giving the following result: 1st pair WL, 2nd pair WL, 3rd pair WW, 4th pair WL and 5th pair WL, thus placing the impression (by applying the key) in the fifth vertical file and thirty-second horizontal file. In Fig. 46*b* the heavy black lines show the sections controlled by each pair and demonstrate how the key was applied.

Instead of reversing the mode of expressing these pairs when the numerical values were adopted, they continued to express them in the same manner, with the result that the numerator appeared as 32 and the denominator as 5, and in order to save the time and trouble of changing the large number of prints, filed by the key, to correspond with the primary classification

FIG. 46*b*



so obtained, they decided simply to invert the fraction, thereby placing the prints in the same compartment as those filed in accordance with the key.

If the first of each pair had been expressed as the denominator instead of the numerator, as explained under "Primary Classifications," there would have been no necessity for inverting.

Fig. 46 is designed merely to show how the cabinet was subdivided into squares when the system was first adopted, for the filing of impressions by the key; for large collections this cabinet is useless, owing to the fact that the collections of certain primary classifications are so large that they occupy several compartments; furthermore, a large number of departments utilizing the finger print system have adopted a smaller sized blank for filing under the drawer system as explained later. If the English Government had adopted the following key when they first started to file their collection of impressions, it would have eliminated the necessity of inverting the primary classification.

LL	WL
LW	WW

Secondary or Sub-Classification. After the primary classification, the secondary or sub-classification is used further to sub-divide the prints having the same primary classifications, the right hand representing the numerator and the left hand the denominator.

The index finger of each hand is known as the fulcrum (meaning support; supporting the primary classification by subdividing same), and is, as explained before, always represented by a capital letter, in accordance with the pattern represented by the impression of said index fingers, as A for arch, T for tented arch, I for inner, M for meet and O for outer, when whorls appear, this being determined by tracing the ridges; if loops appear in the fulcrum, they are represented by the capital letter U if an ulnar and R if a radial loop.

If an arch, tented arch or radial loop should appear either before or after the index finger of either hand (except in cases where a whorl appears in either or both index fingers), they are to be used in connection with the sub-classification, being represented by the small letter, *a*, *t* or *r*, either before or after the capital letter as the case may be, as follows: *a*A*t*, *t*R*a*, *r*U*r*, *a*A*a*, *t*U*t*, etc. Ulnar loops are never considered except when appearing in index fingers, as they are numerous; the radials do not appear as frequently as ulnars, and are always to be considered.

If two or more of either of the above described patterns appear after either index, this is indicated after the capital letter as follows: A2a, A2t, A2r, T2a, T2t, T2r, R2a, R2t, R2r, U2a, U2t, U2r, A3a, A3t, A3r, etc. If either of the three patterns mentioned should appear after the index in combination, they are to be expressed in the order in which they appear, as Aata, Trat, Rt2a, Uara, Aa2r, etc. In cases where an *a*, *t* or *r* either precedes or follows an A, T, R or U in the index fingers, the counting of ridges is dispensed with in secondary classifications.

Having explained the sub-classification of impressions of the lettered group for all fingers, or those in which all fingers are considered, it becomes necessary to take up the cases in which the index fingers alone are considered.

Wherever mention is made of the pattern known as a whorl in explaining the combinations for the sub-classification of impressions, it is meant to include all patterns of the composite type.

Arches, tented arches or radial loops, appearing before or after the index finger in impressions having a whorl in either of the index fingers, are not to be considered in the sub-classification, as whorls are traced in this case and expressed as either I, M, or O, the small *a*, *t* or *r* never being used in connection with I, M, O.

Although the preceding paragraph relative to eliminating the use of the letters *a*, *t* or *r* as a lettered series in connection with I, M or O when whorls appear in either or both index fingers is strictly in accordance with the rule under the Henry system, and although the majority of finger print experts adhere to the rule, it is not considered incorrect to make use of these letters in conjunction with the sub-classification I, M or O; in fact, the finger print experts attached to the Army and Navy Department at Washington, D. C., make use of these letters by expressing them before or after I, M, or O as the case may be, in the same manner as for impressions of the lettered group; as *a*I, I*t*, *r*M, M2*a*, etc.

If an arch or tented arch should appear in the right index and a whorl in the left, it would be expressed as either of the following six combinations: $\frac{A}{I}, \frac{T}{I}, \frac{A}{M}, \frac{T}{M}, \frac{A}{O}, \frac{T}{O}$; for an arch or tented arch in the left and a whorl in the right, the above six combinations are simply reversed, as $\frac{I}{A}, \frac{M}{A}$, etc.

If whorls appear in both index fingers (the middle finger of both hands being represented by some other pattern), the following nine combinations are made possible by ridge tracing: $\frac{I}{I}, \frac{M}{I}, \frac{O}{I}, \frac{I}{M}, \frac{M}{M}, \frac{O}{M}, \frac{I}{O}, \frac{M}{O}, \frac{O}{O}$.

In cases where both index fingers are represented by loops and both middle fingers by whorls, the sub-classification would appear as follows: $\frac{R}{R}, \frac{U}{R}, \frac{R}{U}, \frac{U}{U}$, or four combinations. To further sub-divide these four combinations, each of these loops could be expressed as a second sub-classification, although it is not used by some of the departments, as follows: $\frac{I}{I}, \frac{O}{I}, \frac{I}{O}, \frac{O}{O}$; if it were used, it would give sixteen combinations, as each of the last mentioned four combinations could be used in combination with each of the first four.

A loop appearing in the right index, with a whorl in the left, would give the following six combinations: $\frac{I}{I}, \frac{O}{I}, \frac{I}{M}, \frac{O}{M}, \frac{I}{O}, \frac{O}{O}$; if, however, the whorl appeared in the right and the loop in the left index, the letter M would be expressed as the numerator, instead of as the denominator as shown above. The remaining combinations are not affected by this reversal.

The loop in this case is determined by ridge counting and is thus expressed as either I or O, the capitals R or U never being used in combination with the I, M, O series of whorls. The only patterns represented by capitals in combinations with whorls are arches and tented arches, as previously demonstrated, for the reason that in these patterns there is no tracing or counting of ridges.

Under certain primary classifications, the middle finger of either or both hands is also used in the secondary or sub-classification in connection with the index or fulcrum finger, but only in cases where the index and middle finger of the same hand show the same type of pattern, making a pair; such as two loops in one hand and two whorls in the other; or it may be represented by the appearance of whorls in the index and middle fingers of both hands.

The following combinations of sub-classifications deal with cases where the middle finger is considered, either in the right or left hand, or in both hands.

When a whorl appears in the right index, and an arch, tented arch or loop in the right middle finger, with loops in the index and middle fingers of the left hand, it would appear as one of the following twelve combinations: $\frac{I}{II}, \frac{M}{II}, \frac{O}{II}, \frac{I}{IO}, \frac{M}{IO}, \frac{O}{IO}, \frac{I}{OI}, \frac{M}{OI}, \frac{O}{OI}, \frac{I}{OO}, \frac{M}{OO}, \frac{O}{OO}$; in this case the middle finger of the right hand was not considered, as it appeared as one of the types other than a whorl; if the whorl in this case appeared in the left hand, and the loops in the right hand, the above combinations would be reversed; that is, the I, M, O would appear as denominator, and the II, IO, etc., as the numerator. If an arch or tented arch should appear in the left middle finger instead of a loop, only the index fingers are to be considered.

Whorls in the right index and middle fingers, with a loop in the left index (the left middle finger being represented by a pattern other than a loop), would give the following eighteen combinations:

$$\frac{II}{I}, \quad \frac{IM}{I}, \quad \frac{IO}{I}, \quad \frac{MI}{I}, \quad \frac{MM}{I}, \quad \frac{MO}{I}, \quad \frac{OI}{I}, \quad \frac{OM}{I}, \quad \frac{OO}{I},$$

$$\frac{II}{O}, \quad \frac{IM}{O}, \quad \frac{IO}{O}, \quad \frac{MI}{O}, \quad \frac{MM}{O}, \quad \frac{MO}{O}, \quad \frac{OI}{O}, \quad \frac{OM}{O}, \quad \frac{OO}{O}.$$

If the whorls appear in the left hand and the loop in the right, the above combinations are reversed.

With whorls in right index and middle fingers and a whorl in the left index (the left middle being some other pattern), the following twenty-seven combinations are possible:

$$\frac{II}{I}, \quad \frac{IM}{I}, \quad \frac{IO}{I}, \quad \frac{MI}{I}, \quad \frac{MM}{I}, \quad \frac{MO}{I}, \quad \frac{OI}{I}, \quad \frac{OM}{I}, \quad \frac{OO}{I},$$

$$\frac{II}{M}, \quad \frac{IM}{M}, \quad \frac{IO}{M}, \quad \frac{MI}{M}, \quad \frac{MM}{M}, \quad \frac{MO}{M}, \quad \frac{OI}{M}, \quad \frac{OM}{M}, \quad \frac{OO}{M},$$

$$\frac{II}{O}, \quad \frac{IM}{O}, \quad \frac{IO}{O}, \quad \frac{MI}{O}, \quad \frac{MM}{O}, \quad \frac{MO}{O}, \quad \frac{OI}{O}, \quad \frac{OM}{O}, \quad \frac{OO}{O}.$$

The above combinations are reversed when the left index and middle fingers are considered as the pair and the right index singly.

In impressions in which whorls appear in the index and middle fingers of the right hand, and loops in the same two fingers of

the left hand, the sub-classification would be represented by either of the following thirty-six combinations:

II, II	IM, II	IO, II	MI, II	MM, II	MO, II	OI, II	OM, II	OO, II
II, IO	IM, IO	IO, IO	MI, IO	MM, IO	MO, IO	OI, IO	OM, IO	OO, IO
II, OI	IM, OI	IO, OI	MI, OI	MM, OI	MO, OI	OI, OI	OM, OI	OO, OI
II, OO	IM, OO	IO, OO	MI, OO	MM, OO	MO, OO	OI, OO	OM, OO	OO, OO

If the whorls were in the left hand and the loops in the right, the combinations showing IM, MI, MM, MO and OM would be reversed, these letter-pairs appearing as denominators, but all the other combinations would remain the same; this is caused by reason of the fact that loops are classed as inner and outer, and whorls as inner, meet and outer; the number of combinations as shown above is not changed by the reversal of the patterns from one hand to the other.

If the index and middle fingers of both hands were represented by whorls, the following eighty-one combinations would be possible:

II, II	IM, II	IO, II	MI, II	MM, II	MO, II	OI, II	OM, II	OO, II
II, IM	IM, IM	IO, IM	MI, IM	MM, IM	MO, IM	OI, IM	OM, IM	OO, IM
II, IO	IM, IO	IO, IO	MI, IO	MM, IO	MO, IO	OI, IO	OM, IO	OO, IO
II, MI	IM, MI	IO, MI	MI, MI	MM, MI	MO, MI	OI, MI	OM, MI	OO, MI
II, MM	IM, MM	IO, MM	MI, MM	MM, MM	MO, MM	OI, MM	OM, MM	OO, MM
II, MO	IM, MO	IO, MO	MI, MO	MM, MO	MO, MO	OI, MO	OM, MO	OO, MO
II, OI	IM, OI	IO, OI	MI, OI	MM, OI	MO, OI	OI, OI	OM, OI	OO, OI
II, OM	IM, OM	IO, OM	MI, OM	MM, OM	MO, OM	OI, OM	OM, OM	OO, OM
II, OO	IM, OO	IO, OO	MI, OO	MM, OO	MO, OO	OI, OO	OM, OO	OO, OO

In impressions where the secondary or sub-classification is represented by any combination of I, M, or O, no other letters (such as *a*, *t* or *r*) are used in connection with such combination, either before or after, even though an arch, tented arch or radial loop appears therein.

Second Sub-Classification. The secondary or sub-classification having been thoroughly explained, it becomes necessary to consider the impressions in which a second sub-classification is used to sub-divide the sub-classification; such as impressions having a loop in both index fingers and a loop in either or both middle fingers.

If the right index appeared as a loop, right middle a whorl, with loops in left index and middle fingers, the second sub-classification could be represented by either of the following eight combinations, in connection with the four sub-classifications of R and U, as explained for loops in both index fingers and whorls in both middle fingers; thus giving thirty-two sub-divisions of that particular primary classification:

$$\frac{I}{II},\quad \frac{O}{II},\quad \frac{I}{IO},\quad \frac{O}{IO},\quad \frac{I}{OI},\quad \frac{O}{OI},\quad \frac{I}{OO},\quad \frac{O}{OO}.$$

If the two loops appear in the right hand and the loop and whorl in the left, these combinations are inverted or reversed.

When loops appear in the index and middle fingers of both hands, the following sixteen combinations are to be considered for the second sub-classification; provided, however, that no arch, tented arch or radial loop appears either before or after either of the index fingers:

$$\frac{II}{II},\quad \frac{IO}{II},\quad \frac{OI}{II},\quad \frac{OO}{II},\quad \frac{II}{IO},\quad \frac{IO}{IO},\quad \frac{OI}{IO},\quad \frac{OO}{IO},$$

$$\frac{II}{OI},\quad \frac{IO}{OI},\quad \frac{OI}{OI},\quad \frac{OO}{OI},\quad \frac{II}{OO},\quad \frac{IO}{OO},\quad \frac{OI}{OO},\quad \frac{OO}{OO}.$$

The above combinations are used in connection with the four combinations of R and U, giving sixty-four combinations or divisions of the primary classification.

Final Classification. The final classification of an impression is the numeral used to represent the number of ridges appearing in the right little finger, provided that a loop appears therein;

there being no final count or classification for impressions having an arch, tented arch or whorl in said finger. This numeral is determined by ridge counting, as previously explained, and as this count varies from 1 to 30 or more, it is impossible even to guess the number of sub-divisions under the final count.

Marking Impressions Having Missing, Deformed or Bandaged Fingers. When any finger or fingers are missing (or amputated), or so deformed as to make it impossible to take an impression thereof (that could be classified), or where the finger is bandaged by reason of an injury, the space or spaces provided for said finger or fingers are marked accordingly; as Amputated, Injured, Bandaged, etc. If all digits or fingers are amputated, the spaces are so marked, and an impression of the palms of both hands should be taken, for reasons set forth under the classification of missing fingers.

Classifying Missing, Deformed or Bandaged Fingers. In classifying impressions where any of the fingers are missing, or so deformed as to make it impossible to take an impression of them, or to determine the type of pattern, such finger or fingers are classified the same as the corresponding finger or fingers of the other hand; that is, if the right ring finger was missing and the left ring finger appeared as an ulnar loop, the missing finger would be classified as an ulnar loop also; if the missing finger is one in which ridge tracing or counting is necessary, its classification would be governed by the result of tracing or counting the ridges in the corresponding finger of the other hand.

If the same finger or fingers of both hands are missing, they are classified as whorls, and if they were either of the fingers where ridge tracing is resorted to for the sub-classification (such as the index or middle fingers), they would be classified as meet (M) whorl or whorls, as the case may be. When all the fingers of one hand are missing, they are deemed to be the same as the corresponding fingers of the other hand, and are so classified.

The question of taking and classifying impressions of persons where the ten fingers are amputated, has never to my knowledge been considered by an authority on finger impressions, therefore the taking of the palms (as shown by Fig. 48) has been resorted to, so as to make positive identifications in all cases of this kind; for loops, arches, whorls, etc., are plainly visible in the palms,

and differ in various persons as does the ridge surface of the outer joint of the fingers, there being no two persons with the same ridge characteristics.

When the ten digits or fingers are missing as explained above, the rule relative to impressions having the same finger or fingers of both hands missing is applied in their classification (that is making them whorls and meet (M) whorls in the index and middle fingers of both hands) thereby giving the following classification, $\frac{32}{32}\frac{MM}{MM}$, the palms being thus relied upon for making comparisons and identifications. If the hands were also missing, an impression of the soles of the feet could be taken.

It very often happens that persons who are to be finger printed have one or more fingers, or even one of their hands bandaged, making it impossible to take an impression of same; from experience, I would advise that in cases of this kind the bandaged fingers be examined to determine the type of pattern therein, and that the finger print blank be marked accordingly; if this could not be done, I would advise the taking of four sets of impressions of the fingers that are not bandaged, and the filing of one print under the arches, one under the tented arches, one under the loops and one under the whorls. This may appear superfluous and unnecessary, but it will prevent failure in making an identification of such a person, should his impression be again taken at a later date with the bandage removed; in such case the extra prints that were filed as a precautionary measure could be removed from the file, and the correct print substituted.

Oddities and Their Classification. Under this heading we have impressions of persons who are born with more than five fingers on a hand; and as there is no rule given in previous publications on the finger print subject for the classification of impressions with more than ten fingers (only ten spaces being provided on finger print blanks), the following mode of procedure is suggested for the taking and classification of such impressions.

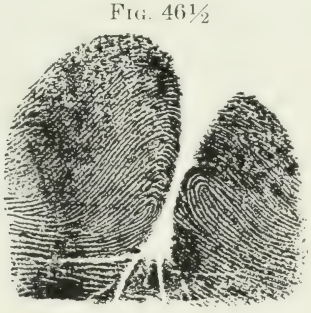
The thumb and the next four fingers of the hand or hands having this peculiarity are taken in their proper sequence on the finger print blank for their regular classification as for ten fingers, the extra finger or fingers being impressed on the back of the print or in some other appropriate space and a note made thereon

of the fact that such person had six or more fingers on the right or left hand or both hands as the case may be.

This matter is mentioned owing to the fact that recently a case of this kind presented itself and the impressions were taken under the above ruling; this same person was later again finger printed and his impressions found in the file showed that he had at that time six fingers on his right hand, but the impressions taken at this later date only showed five fingers; upon an examination of the hand it showed that during the interval between the taking of the original and duplicate impressions the extra finger had been amputated or removed.

It not infrequently happens that persons to be finger-printed have been born with two or more fingers webbed or grown together, making the taking of a rolled impression of such fingers impossible; in such cases the spaces provided for rolled impressions are marked with the sign or symbol to correspond with the

FIG. 46½



type of patterns represented by the fingers so webbed, a plain or simultaneous impression is taken of these fingers at the bottom of such finger print blank, and a note is made on the blank of the fact of such deformity. The fingers that are not webbed are taken as in other cases where no deformity appears; the impressions are then classified in accordance with the rules given for the classification of other prints.

Another oddity which recently came to my notice, and for which no rule has been provided under classification of impressions, is an impression of what might be termed a split thumb, or a thumb having two outer or nail joints, one alongside of the other, with each joint represented by a pattern of either one of

the various types, or both joints represented by the same type of pattern; such as two ulnar loops, or one ulnar loop and one radial loop, or two whorls or composites, etc.

In classifying a set of finger prints in which an impression of a split thumb appears, no consideration is given to the pattern represented by the joint toward the outside of the hand; the print being classified as though this joint was absent; the pattern represented by the joint nearest the hand determining the classification for the thumb. (See Fig. 46½.)

While the rule governing the classification of missing or deformed fingers (in which the pattern cannot be determined) provides that they be classified the same as the corresponding fingers, it very often happens that such amputations or deformities occur after the taking of the original set of impressions, and in order to make a proper and complete search of the file it becomes necessary to consider not only such classification, but all classifications under which these fingers could be represented. Where a single finger is to be considered, this is not very difficult, but where a number of fingers are amputated it requires an exhaustive search under various primary classifications. See explanation under "Combinations."

PART II.

PART II.

Points of Comparison or Characteristic Marks. After an impression has been classified, a search of the files is made by comparing the impression with those of the same classification, to determine whether the person to whom said prints belong had a previous finger print record. In order to properly make comparisons, it is necessary that the person making the search be familiar with the various points or characteristics appearing in finger impressions, numerous peculiarities of ridges being readily perceivable to the naked eye, such as the general contour of the pattern, ridge bifurcations (individual ridges branching out into two ridges), what is known as an island (this being caused by a ridge bifurcating but again joining into one), abrupt ending ridges, some peculiarity as to the formation of the delta or core, short ridge lines, etc.

While the above are the most frequently occurring characteristics, any point or peculiarity out of the ordinary may be considered in making comparisons. (See Fig. 47.) In some cases a scar (Fig. 10) might be used as one of the points; but consideration could only be given in cases where such scar appeared also in an impression taken at some previous time. Warts and creases in the skin are also considered (in addition to other characteristics), provided, however, they appear in both impressions; but it is not advisable to place too much confidence in such points, for the reason that warts and creases are not permanent. (Fig. 9.)

It is very important that great care be exercised, not only in classifying a print, but in making the comparison, as an error, such as a wrong identification, or failing to find a previous print when the same is actually on file, is sure to cause a doubt in the minds of numerous persons as to the infallibility of finger impressions.

Another important point to remember in classifying impressions is the marking of all impressions in accordance with the

pattern therein represented, and if the print be one that is a questionable pattern, such as a loop having the appearance of an arch, or a central pocket loop which might have been classed as a loop by another expert, it is always, when making a search, first considered under the type of pattern as marked, and if not found it is searched for under the type as questioned.

It is a well known fact, that very often a pattern presents itself, where the distinction as to whether it is a loop or an arch, a tented arch or a loop, a central pocket loop or a regular loop, is so close that it is almost impossible to determine the type or class, but if the above rule is applied to all such cases no difficulty will be experienced in locating an impression of this kind, provided the same is on file.

Filing Prints. After an impression has been properly classified and a search made by comparing said print with those on file of the same classification, the impression is placed in the files, if not already on file by reason of a previous arrest.

In filing finger prints, the first thing to consider is the primary classification, which is represented by numerals in the form of a fraction, as $\frac{1}{1}, \frac{5}{17}, \frac{11}{24}, \frac{32}{32}$, etc., the denominator always being considered first, since the numeral representing the denominator designates the file under which all impressions having the same denominator are filed; after the file wanted has been determined, the numeral representing the numerator is considered in the order of 1, 2, 3, etc., to 32; when the prints, having the same primary classification as the print to be filed have been reached, the denominator of the secondary or sub-classification is considered in the following order: A, T, R, U, when arches, tented arches and loops appear in combination; I, M, O, when either or both index fingers are represented by a whorl or a loop in one index with a whorl in the other. In the numerator the same order is to be maintained; in fact, this order of preference is considered through the entire system of filing.

In impressions consisting of all loops, where the secondary classification is represented by R or U, radials precede ulnars as shown above, these being further sub-divided by the second sub-classification represented by I and O, the order of preference being the same as previously explained.

After the primary, secondary and second sub-classifications have been considered, there are still impressions having what is known as the final classification, obtained by the counting of ridges in the loop appearing in the right little finger; the final classification always being expressed in numerals, the impressions are filed in the 1, 2, 3 order. (See schedule showing order of filing.)

Cabinets for Filing. The cabinet for filing finger impressions, as used by some departments, is divided into vertical compartments, each of which is fitted with a number of movable shelves to admit of shifting up or down as the collection of prints of certain classifications increases. To file prints in this style of cabinet it becomes necessary to provide stiff covers, between which the prints are placed in the proper order of classification, these covers being bound with canvas straps to prevent the prints from becoming separated.

The above system, which is known as the open filing cabinet, was adopted by the English, and while it answers the purpose it is somewhat antiquated, and cannot compare with the modern system of filing finger prints in drawers, for the following reasons:

1. Under the old system, the cardboard covers are always dirty and dusty, because it is an open cabinet, while the drawer system is clean and sanitary.

2. The old style cabinet has the classification of each file of prints pasted at the side of each compartment, having no index for sub-dividing large accumulations; while under the drawer system every possible combination of a file of prints can be divided by guide cards, showing each and every sub-division.

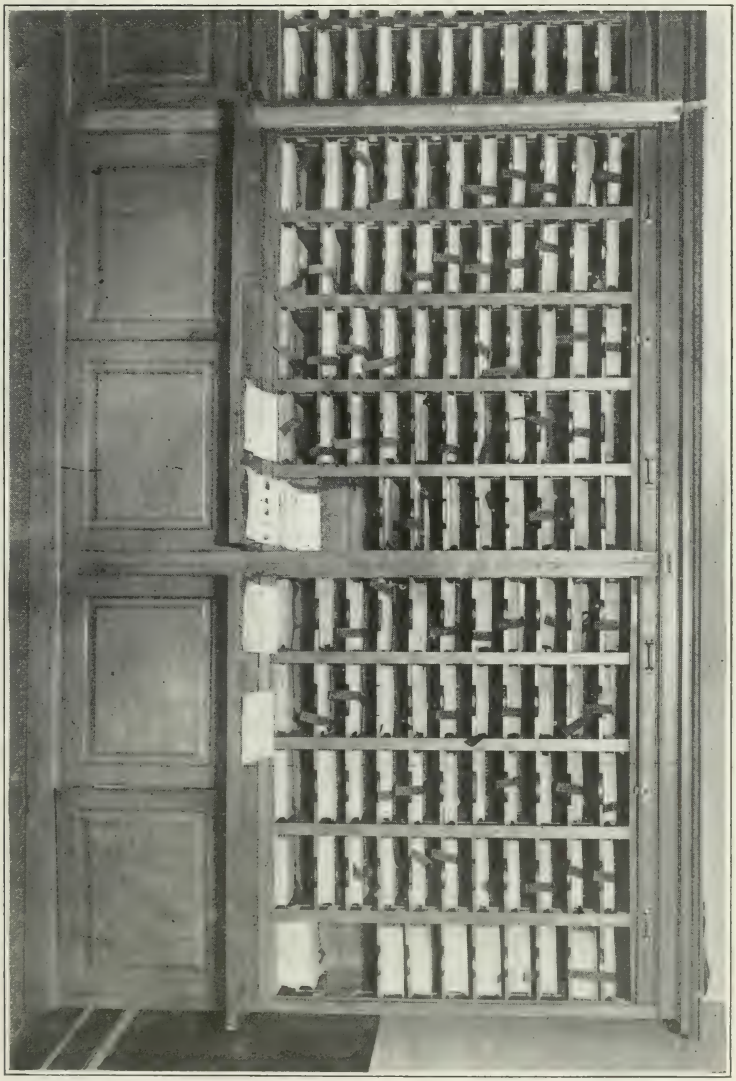
3. In making a search of the files in the open cabinet it becomes necessary to handle numerous impressions not required for comparison, and involves a loss of time in opening and closing the canvas binding strap every time a file of prints is used; the guide cards under the drawer system have each classification printed thereon, which necessitates only the removal of such impressions as are actually required in making a search.

4. The filing of prints in the open cabinet requires the services of a person who is thoroughly familiar with all combinations possible under the classification of prints, and with the order in which said combinations follow each other; but under the drawer system this is entirely eliminated by the guide cards, and the filing of prints can be done by any person who is able to file cards under an alphabetical index.

5. In the old style cabinet, when a certain file or files of prints become so large as to necessitate subdivision it means that every file following, or coming after the one to be sub-divided, must be shifted to another compartment; it also necessitates the removal of the slips which are pasted at the sides of these compartments, and the substitution of new slips to correspond to the files as shifted; while under the drawer system, another guide card is simply inserted where required and the file or files separated as desired.

FINGER PRINT FILING CABINET
(DRAWER SYSTEM)

For the guidance of all persons connected with departments having finger print collections, and those interested in the study of finger prints, a schedule has been arranged showing all possible



OPEN FILING CABINET FOR FINGER PRINTS

combinations or classifications under the Henry System of classifying now in use, the combinations being arranged in the proper order for the filing of impressions. Under the finger print system, we have two series of impressions governing the order of filing impressions under the secondary or sub-classification; the first being the A, T, R, U series, and the second the I, M, O; the preference in filing being given in the order shown above. (See schedule of combinations.)

In large collections of certain primary classifications, the number of combinations shown in the schedule may be increased at will in any manner convenient to the expert having supervision of the collection, there being no rule governing the same; example, $\frac{32}{32}\ \frac{00}{00}$, being a large collection, could be further divided by tracing the whorl in the little finger of both hands and expressing the same as $\frac{32}{32}\ \frac{00}{00}\ \frac{I}{M}$, giving nine sub-divisions for this particular classification; or in impressions having all loops the following classification $\frac{1}{1}\ \frac{U}{U}\ \frac{OO}{OO}\ 15$ could be expressed as $\frac{1}{1}\ \frac{U}{U}\ \frac{OO}{OO}\ \frac{15}{17}$ by counting the ridges in the left little finger.

As a matter of fact, when a person has become proficient in the system of finger impressions he may abandon the Henry System of classifying, and adopt a system of his own; such as using the right hand for the numerator and the left for the denominator of the primary classification, the same as now used for the sub and final classifications, by giving each thumb the value of 16, each index 8, each middle finger 4, each ring finger 2 and each little finger 1, when whorls appear therein; instead of taking the first of each pair for the denominator and the second of each pair for the numerator, as described under the Henry System.

SCHEDULE OF COMBINATIONS AND ORDER OF FILING

1/1 A/A	1/1 rAr/A	1/1 aAtr/A
1/1 aA/A	1/1 A2a/A	1/1 aAra/A
1/1 tA/A	1/1 Aat/A	1/1 aArt/A
1/1 rA/A	1/1 Aar/A	1/1 aA2r/A
1/1 Aa/A	1/1 Ata/A	1/1 tA2a/A
1/1 At/A	1/1 A2t/A	1/1 tAat/A
1/1 Ar/A	1/1 Atr/A	1/1 tAar/A
1/1 aAa/A	1/1 Ara/A	1/1 tAta/A
1/1 aAt/A	1/1 Art/A	1/1 tA2t/A
1/1 aAr/A	1/1 A2r/A	1/1 tAtr/A
1/1 tAa/A	1/1 aA2a/A	1/1 tAra/A
1/1 tAt/A	1/1 aAat/A	1/1 tArt/A
1/1 tAr/A	1/1 aAar/A	1/1 tA2r/A
1/1 rAa/A	1/1 aAta/A	1/1 rA2a/A
1/1 rAt/A	1/1 aA2t/A	1/1 rAat/A

SCHEDULE—Continued

1/1 rAar A	1/1 Aa2r A	1/1 Artr A
1/1 rAta A	1/1 At2a A	1/1 A2ra A
1/1 rA2t A	1/1 Atat A	1/1 A2rt A
1/1 rAtr A	1/1 Atar A	1/1 A3r A
1/1 rAra A	1/1 A2ta A	1/1 aA3a A
1/1 rArt A	1/1 A3t A	1/1 aA2at A
1/1 rA2r A	1/1 A2tr A	1/1 aA2ar A
1/1 A3a A	1/1 Atra A	1/1 aAata A
1/1 A2at A	1/1 Atrt A	1/1 aAa2t A
1/1 A2ar A	1/1 At2r A	1/1 aAatr A
1/1 Aata A	1/1 Ar2a A	1/1 aAara A
1/1 Aa2t A	1/1 Arat A	1/1 aAart A
1/1 Aatr A	1/1 Arar A	1/1 aAa2r A
1/1 Aara A	1/1 Arta A	1/1 aAt2a A
1/1 Aart A	1/1 Ar2t A	1/1 aAtat A

SCHEDULE—Continued

1/1 aAtar A	1/1 aA3r A	1/1 tA2tr A
1/1 aA2ta A	1/1 tA3a A	1/1 tAtra A
1/1 aA3t A	1/1 tA2at A	1/1 tAtrt A
1/1 aA2tr A	1/1 tA2ar A	1/1 tAt2r A
1/1 aAtra A	1/1 tAata A	1/1 tAr2a A
1/1 aAtrt A	1/1 tAa2t A	1/1 tArat A
1/1 aAt2r A	1/1 tAatr A	1/1 tArar A
1/1 aAr2a A	1/1 tAara A	1/1 tArta A
1/1 aArat A	1/1 tAart A	1/1 tAr2t A
1/1 aArar A	1/1 tAa2r A	1/1 tArtr A
1/1 aArta A	1/1 tAt2a A	1/1 tA2ra A
1/1 aAr2t A	1/1 tAtat A	1/1 tA2rt A
1/1 aArtr A	1/1 tAtar A	1/1 tA3r A
1/1 aA2ra A	1/1 tA2ta A	1/1 rA3a A
1/1 aA2rt A	1/1 tA3t A	1/1 rA2at A

SCHEDULE—Continued

$\frac{1}{1}\ \frac{rA2ar}{A}$	$\frac{1}{1}\ \frac{rAt2r}{A}$
$\frac{1}{1}\ \frac{rAata}{A}$	$\frac{1}{1}\ \frac{rAr2a}{A}$
$\frac{1}{1}\ \frac{rAa2t}{A}$	$\frac{1}{1}\ \frac{rArat}{A}$
$\frac{1}{1}\ \frac{rAatr}{A}$	$\frac{1}{1}\ \frac{rArar}{A}$
$\frac{1}{1}\ \frac{rAara}{A}$	$\frac{1}{1}\ \frac{rArta}{A}$
$\frac{1}{1}\ \frac{rAart}{A}$	$\frac{1}{1}\ \frac{rAr2t}{A}$
$\frac{1}{1}\ \frac{rAa2r}{A}$	$\frac{1}{1}\ \frac{rArtr}{A}$
$\frac{1}{1}\ \frac{rAt2a}{A}$	$\frac{1}{1}\ \frac{rA2ra}{A}$
$\frac{1}{1}\ \frac{rAtat}{A}$	$\frac{1}{1}\ \frac{rA2rt}{A}$
$\frac{1}{1}\ \frac{rAtar}{A}$	$\frac{1}{1}\ \frac{rA3r}{A}$
$\frac{1}{1}\ \frac{rA2ta}{A}$	
$\frac{1}{1}\ \frac{rA3t}{A}$	
$\frac{1}{1}\ \frac{rA2tr}{A}$	
$\frac{1}{1}\ \frac{rAtra}{A}$	
$\frac{1}{1}\ \frac{rAtrt}{A}$	

These classifications show 160 changes in the numerator for the $\frac{1}{1}\ \frac{A}{A}$ lettered series, and as each of these can be used in combination with each other (by using them for the denominator in the order as shown for the numerator), it would give 25,600 combinations or classifications.

SCHEDULE—Continued

$\frac{1}{1}\ \frac{T}{A}$

$\frac{1}{1}\ \frac{R}{A}$

$\frac{1}{1}\ \frac{U}{A}$

$\frac{1}{1}\ \frac{A}{T}$

$\frac{1}{1}\ \frac{T}{T}$

$\frac{1}{1}\ \frac{R}{T}$

$\frac{1}{1}\ \frac{U}{T}$

$\frac{1}{1}\ \frac{A}{R}$

$\frac{1}{1}\ \frac{T}{R}$

$\frac{1}{1}\ \frac{R}{R}$

$\frac{1}{1}\ \frac{U}{R}$

$\frac{1}{1}\ \frac{A}{U}$

$\frac{1}{1}\ \frac{T}{U}$

$\frac{1}{1}\ \frac{R}{U}$

$\frac{1}{1}\ \frac{U}{U}$

Each of these sub-classifications (except those showing loops in both index fingers) has 25,600 variations as shown for $\frac{1}{1}\ \frac{A}{A}$ lettered series, when *a*, *t*, or *r* appears before or after the index fingers.

When loops appear in both index fingers, as $\frac{R}{R}$, $\frac{U}{R}$, $\frac{R}{U}$, $\frac{U}{U}$, there is one less, owing to the fact that they do not belong to the lettered class unless *a*, *t*, or *r* appears either before or after such loops, but have 16 additional changes each in the form of a second sub-classification, the result of ridge counting in index and middle fingers.

SCHEDULE—Continued

$\frac{1}{1}\ \frac{R}{R}\ \frac{II}{II}$

$\frac{1}{1}\ \frac{R}{R}\ \frac{IO}{II}$

$\frac{1}{1}\ \frac{R}{R}\ \frac{OI}{II}$

$\frac{1}{1}\ \frac{R}{R}\ \frac{OO}{II}$

Representing 16 combinations or changes in the second sub-classification for impressions not included in the lettered group.

The impressions in this group are filed directly after the lettered group having the same sub-classification, as $\frac{R}{R}$ of this group follows $\frac{R}{R}$ lettered, $\frac{U}{R}$ after $\frac{U}{R}$ lettered, etc.

$\frac{1}{1}\ \frac{R}{R}\ \frac{II}{IO}$

$\frac{1}{1}\ \frac{R}{R}\ \frac{IO}{IO}$

$\frac{1}{1}\ \frac{R}{R}\ \frac{OI}{IO}$

$\frac{1}{1}\ \frac{R}{R}\ \frac{OO}{IO}$

$\frac{1}{1}\ \frac{R}{R}\ \frac{II}{OI}$

$\frac{1}{1}\ \frac{R}{R}\ \frac{IO}{OI}$

$\frac{1}{1}\ \frac{R}{R}\ \frac{OI}{OI}$

$\frac{1}{1}\ \frac{R}{R}\ \frac{OO}{OI}$

$\frac{1}{1}\ \frac{R}{R}\ \frac{II}{OO}$

$\frac{1}{1}\ \frac{R}{R}\ \frac{IO}{OO}$

$\frac{1}{1}\ \frac{R}{R}\ \frac{OI}{OO}$

$\frac{1}{1}\ \frac{R}{R}\ \frac{OO}{OO}$

$\frac{1}{1}\ \frac{U}{R}$

$\frac{1}{1}\ \frac{R}{U}$

$\frac{1}{1}\ \frac{U}{U}$

Each having 16 groups as shown for $\frac{R}{R}$.

SCHEDULE—Continued

$\frac{3}{1}\ \frac{R}{R}\ \frac{II}{I}$

$\frac{3}{1}\ \frac{R}{R}\ \frac{IO}{I}$

$\frac{3}{1}\ \frac{R}{R}\ \frac{OI}{I}$

$\frac{3}{1}\ \frac{R}{R}\ \frac{OO}{I}$

The lettered group under this primary classification is similar to that shown for the A series.

The second sub-classification in this case has 8 combinations instead of 16, as only three fingers are considered in the ridge count, the left middle finger being a whorl.

$\frac{3}{1}\ \frac{R}{R}\ \frac{II}{O}$

$\frac{3}{1}\ \frac{R}{R}\ \frac{IO}{O}$

$\frac{3}{1}\ \frac{R}{R}\ \frac{OI}{O}$

$\frac{3}{1}\ \frac{R}{R}\ \frac{OO}{O}$

$\frac{3}{1}\ \frac{U}{R}$

$\frac{3}{1}\ \frac{R}{U}$

$\frac{3}{1}\ \frac{U}{U}$

Each having 8 combinations as shown above.

SCHEDULE—Continued

17 I
1 A

17 M
1 A

17 O
1 A

17 I
1 T

17 M
1 T

17 O
1 T

Provides 6 combinations for A and T when appearing in the left index, the right index being a whorl. A and T are the only letters used in combination with I, M, or O, when appearing in one of the index fingers. They are not considered before or after whorls.

SCHEDULE—Continued

$\frac{17}{1}\ \frac{I}{I}$	$\frac{17}{1}\ \frac{I}{O}$
$\frac{17}{1}\ \frac{I}{II}$	$\frac{17}{1}\ \frac{I}{OI}$
$\frac{17}{1}\ \frac{M}{I}$	$\frac{17}{1}\ \frac{M}{O}$
$\frac{17}{1}\ \frac{M}{II}$	$\frac{17}{1}\ \frac{M}{OI}$
$\frac{17}{1}\ \frac{O}{I}$	$\frac{17}{1}\ \frac{O}{O}$
$\frac{17}{1}\ \frac{O}{II}$	$\frac{17}{1}\ \frac{O}{OI}$
$\frac{17}{1}\ \frac{I}{IO}$	$\frac{17}{1}\ \frac{I}{OO}$
$\frac{17}{1}\ \frac{M}{IO}$	$\frac{17}{1}\ \frac{M}{OO}$
$\frac{17}{1}\ \frac{O}{IO}$	$\frac{17}{1}\ \frac{O}{OO}$

Provides 12 combinations in the sub-classification for whorl in right index, with loops in left index and middle fingers.

It provides 6 additional combinations, as $\frac{I}{I}$, $\frac{M}{I}$, $\frac{O}{I}$, etc., when an *a* or *t* appears in the left middle finger instead of a loop. In such cases the *a* and *t* are not expressed in the classification.

SCHEDULE—Continued

$\frac{19}{1}\ \frac{I}{A}$

$\frac{19}{1}\ \frac{M}{A}$

$\frac{19}{1}\ \frac{O}{A}$

$\frac{19}{1}\ \frac{I}{T}$

The combinations for A and T are the same as shown for $\frac{17}{1}$.

$\frac{19}{1}\ \frac{M}{T}$

$\frac{19}{1}\ \frac{O}{T}$

$\frac{19}{1}\ \frac{I}{I}$

$\frac{19}{1}\ \frac{M}{I}$

$\frac{19}{1}\ \frac{O}{I}$

A whorl in right index and loop in the left, with whorl in left middle, provides for 6 combinations instead of the 12 shown for the primary $\frac{17}{1}$, the left middle finger not being considered.

$\frac{19}{1}\ \frac{I}{O}$

$\frac{19}{1}\ \frac{M}{O}$

$\frac{19}{1}\ \frac{O}{O}$

SCHEDULE—Continued

$\frac{1}{3}$	$\frac{A}{I}$	$\frac{1}{3}$	$\frac{IO}{M}$	
$\frac{1}{3}$	$\frac{T}{I}$	$\frac{1}{3}$	$\frac{O}{M}$	
$\frac{1}{3}$	$\frac{I}{I}$	$\frac{1}{3}$	$\frac{OI}{M}$	Provides 6 combinations for impressions having A or T in the right index finger with a whorl in the left, and 12 combinations for impressions having a loop in the right index and middle fingers, with a whorl in the left index; also 6 additional for impressions having an *a* or *t* in the right middle finger, which is not considered as in the lettered group.
$\frac{1}{3}$	$\frac{II}{I}$	$\frac{1}{3}$	$\frac{OO}{M}$	
$\frac{1}{3}$	$\frac{IO}{I}$	$\frac{1}{3}$	$\frac{A}{O}$	
$\frac{1}{3}$	$\frac{O}{I}$	$\frac{1}{3}$	$\frac{T}{O}$	
$\frac{1}{3}$	$\frac{OI}{I}$	$\frac{1}{3}$	$\frac{I}{O}$	
$\frac{1}{3}$	$\frac{OO}{I}$	$\frac{1}{3}$	$\frac{II}{O}$	The combinations under the primary $\frac{1}{3}$ are reversed to those shown for $\frac{17}{1}$.
$\frac{1}{3}$	$\frac{A}{M}$	$\frac{1}{3}$	$\frac{IO}{O}$	
$\frac{1}{3}$	$\frac{T}{M}$	$\frac{1}{3}$	$\frac{O}{O}$	
$\frac{1}{3}$	$\frac{I}{M}$	$\frac{1}{3}$	$\frac{OI}{O}$	
$\frac{1}{3}$	$\frac{II}{M}$	$\frac{1}{3}$	$\frac{OO}{O}$	

SCHEDULE—Continued

$\frac{3}{3}\ \frac{I\ I}{I\ I}$	$\frac{3}{3}\ \frac{I\ I}{M\ I}$	$\frac{3}{3}\ \frac{I\ I}{O\ I}$
$\frac{3}{3}\ \frac{I\ O}{I\ I}$	$\frac{3}{3}\ \frac{I\ O}{M\ I}$	$\frac{3}{3}\ \frac{I\ O}{O\ I}$
$\frac{3}{3}\ \frac{O\ I}{I\ I}$	$\frac{3}{3}\ \frac{O\ I}{M\ I}$	$\frac{3}{3}\ \frac{O\ I}{O\ I}$
$\frac{3}{3}\ \frac{O\ O}{I\ I}$	$\frac{3}{3}\ \frac{O\ O}{M\ I}$	$\frac{3}{3}\ \frac{O\ O}{O\ I}$
$\frac{3}{3}\ \frac{I\ I}{I\ M}$	$\frac{3}{3}\ \frac{I\ I}{M\ M}$	$\frac{3}{3}\ \frac{I\ I}{O\ M}$
$\frac{3}{3}\ \frac{I\ O}{I\ M}$	$\frac{3}{3}\ \frac{I\ O}{M\ M}$	$\frac{3}{3}\ \frac{I\ O}{O\ M}$
$\frac{3}{3}\ \frac{O\ I}{I\ M}$	$\frac{3}{3}\ \frac{O\ I}{M\ M}$	$\frac{3}{3}\ \frac{O\ I}{O\ M}$
$\frac{3}{3}\ \frac{O\ O}{I\ M}$	$\frac{3}{3}\ \frac{O\ O}{M\ M}$	$\frac{3}{3}\ \frac{O\ O}{O\ M}$
$\frac{3}{3}\ \frac{I\ I}{I\ O}$	$\frac{3}{3}\ \frac{I\ I}{M\ O}$	$\frac{3}{3}\ \frac{I\ I}{O\ O}$
$\frac{3}{3}\ \frac{I\ O}{I\ O}$	$\frac{3}{3}\ \frac{I\ O}{M\ O}$	$\frac{3}{3}\ \frac{I\ O}{O\ O}$
$\frac{3}{3}\ \frac{O\ I}{I\ O}$	$\frac{3}{3}\ \frac{O\ I}{M\ O}$	$\frac{3}{3}\ \frac{O\ I}{O\ O}$
$\frac{3}{3}\ \frac{O\ O}{I\ O}$	$\frac{3}{3}\ \frac{O\ O}{M\ O}$	$\frac{3}{3}\ \frac{O\ O}{O\ O}$

Provides 36 combinations for impressions having a loop in the right index and middle fingers, with a whorl in the left index and middle fingers.

When an A (arch) or T (tented arch) appears in the right index finger, the combinations are the same as shown for $\frac{1}{3}$.

SCHEDULE—Continued

$\frac{17}{3}$	$\frac{I}{I}$	
$\frac{17}{3}$	$\frac{M}{I}$	
$\frac{17}{3}$	$\frac{O}{I}$	Provides 9 combinations for impressions having a whorl in both index fingers, the middle fingers not being considered.
$\frac{17}{3}$	$\frac{I}{M}$	
$\frac{17}{3}$	$\frac{M}{M}$	
$\frac{17}{3}$	$\frac{O}{M}$	
$\frac{17}{3}$	$\frac{I}{O}$	
$\frac{17}{3}$	$\frac{M}{O}$	
$\frac{17}{3}$	$\frac{O}{O}$	

SCHEDULE—Continued

19/3	I/II	19/3	I/MO	
19/3	M/II	19/3	M/MO	
19/3	O/II	19/3	O/MO	
19/3	I/IM	19/3	I/OI	
19/3	M/IM	19/3	M/OI	Provides 27 combinations for impressions having a whorl in both index fingers and in left middle finger.
19/3	O/IM	19/3	O/OI	
19/3	I/IO	19/3	I/OM	
19/3	M/IO	19/3	M/OM	
19/3	O/IO	19/3	O/OM	
19/3	I/MI	19/3	I/OO	
19/3	M/MI	19/3	M/OO	
19/3	O/MI	19/3	O/OO	
19/3	I/MM			
19/3	M/MM			
19/3	O/MM			

SCHEDULE—Continued

$\frac{1}{9}\ \frac{R}{R}\ \frac{I}{II}$

$\frac{1}{9}\ \frac{R}{R}\ \frac{O}{II}$

The lettered group under this primary classification is similar to that shown for the A series.

$\frac{1}{9}\ \frac{R}{R}\ \frac{I}{IO}$

The second sub-classification in this case provides 8 combinations, being reversed to those shown for the primary classification $\frac{3}{1}$.

$\frac{1}{9}\ \frac{R}{R}\ \frac{O}{IO}$

$\frac{1}{9}\ \frac{R}{R}\ \frac{I}{OI}$

$\frac{1}{9}\ \frac{R}{R}\ \frac{O}{OI}$

$\frac{1}{9}\ \frac{R}{R}\ \frac{I}{OO}$

$\frac{1}{9}\ \frac{R}{R}\ \frac{O}{OO}$

$\frac{1}{9}\ \frac{U}{R}$

$\frac{1}{9}\ \frac{R}{U}$

Each having 8 combinations as shown above.

$\frac{1}{9}\ \frac{U}{U}$

SCHEDULE—Continued

$\frac{3\ R}{9\ R}$

$\frac{3\ U}{9\ R}$

Lettered groups under this primary classification similar to A series.

$\frac{3\ R}{9\ U}$

$\frac{3\ U}{9\ U}$

$\frac{3\ R\ I}{9\ R\ I}$

In addition to the sub-classifications shown above, it provides 4 combinations in the second sub-classification, the result of ridge counting in index fingers.

$\frac{3\ R\ O}{9\ R\ I}$

Some experts do not use the additional subdivisions, as this collection is not very large.

$\frac{3\ R\ I}{9\ R\ O}$

$\frac{3\ R\ O}{9\ R\ O}$

SCHEDULE—Continued

17/9 I I / I I	17/9 M I / I O	17/9 O I / O I
17/9 I M / I I	17/9 M M / I O	17/9 O M / O I
17/9 I O / I I	17/9 M O / I O	17/9 O O / O I
17/9 M I / I I	17/9 O I / I O	17/9 I I / O O
17/9 M M / I I	17/9 O M / I O	17/9 I M / O O
17/9 M O / I I	17/9 O O / I O	17/9 I O / O O
17/9 O I / I I	17/9 I I / O I	17/9 M I / O O
17/9 O M / I I	17/9 I M / O I	17/9 M M / O O
17/9 O O / I I	17/9 I O / O I	17/9 M O / O O
17/9 I I / I O	17/9 M I / O I	17/9 O I / O O
17/9 I M / I O	17/9 M M / O I	17/9 O M / O O
17/9 I O / I O	17/9 M O / O I	17/9 O O / O O

Provides 36 combinations when whorls appear in right index and middle fingers, with loops in left index and middle fingers.

When an A (arch) or T (tented arch) appears in the left index finger, the combinations are the same as those shown under a previous primary classification.

SCHEDULE—Continued

19/9	II/I	19/9	MI/O
19/9	IM/I	19/9	MM/O
19/9	IO/I	19/9	MO/O
19/9	MI/I	19/9	OI/O
19/9	MM/I	19/9	OM/O
19/9	MO/I	19/9	OO/O
19/9	OI/I		
19/9	OM/I		
19/9	OO/I		
19/9	II/O		
19/9	IM/O		
19/9	IO/O		

Provides 18 combinations when whorls appear in the index and middle fingers of the right hand with a loop in index and whorl in middle finger of left hand.

When A or T appears in the left index finger the sub-classification is the same as previously shown.

SCHEDULE—Continued

$\frac{1}{11}$	$\frac{I}{I}$	
$\frac{1}{11}$	$\frac{O}{I}$	
$\frac{1}{11}$	$\frac{I}{M}$	Provides 6 combinations for impressions having a loop in the right index, with a whorl in the left, the middle fingers not being considered. For A or T in the right index the sub-classification is the same as previously shown.
$\frac{1}{11}$	$\frac{O}{M}$	
$\frac{1}{11}$	$\frac{I}{O}$	
$\frac{1}{11}$	$\frac{O}{O}$	

SCHEDULE—Continued

$\frac{3}{11}\ \frac{I}{II}$	$\frac{3}{11}\ \frac{I}{OI}$
$\frac{3}{11}\ \frac{O}{II}$	$\frac{3}{11}\ \frac{O}{OI}$
$\frac{3}{11}\ \frac{I}{IM}$	$\frac{3}{11}\ \frac{I}{OM}$
$\frac{3}{11}\ \frac{O}{IM}$	$\frac{3}{11}\ \frac{O}{OM}$
$\frac{3}{11}\ \frac{I}{IO}$	$\frac{3}{11}\ \frac{I}{OO}$
$\frac{3}{11}\ \frac{O}{IO}$	$\frac{3}{11}\ \frac{O}{OO}$
$\frac{3}{11}\ \frac{I}{MI}$	
$\frac{3}{11}\ \frac{O}{MI}$	
$\frac{3}{11}\ \frac{I}{MM}$	
$\frac{3}{11}\ \frac{O}{MM}$	
$\frac{3}{11}\ \frac{I}{MO}$	
$\frac{3}{11}\ \frac{O}{MO}$	

Provides 18 combinations when a loop appears in right index, with whorls in left index and middle fingers, right middle finger not being considered.

When A or T appears in right index finger the sub-classification is the same as shown under a previous primary classification.

SCHEDULE—Continued

17/11	II/I	17/11	MI/M	17/11	OI/O
17/11	IM/I	17/11	MM/M	17/11	OM/O
17/11	IO/I	17/11	MO/M	17/11	OO/O
17/11	MI/I	17/11	OI/M		
17/11	MM/I	17/11	OM/M		
17/11	MO/I	17/11	OO/M		
17/11	OI/I	17/11	II/O		
17/11	OM/I	17/11	IM/O		
17/11	OO/I	17/11	IO/O		
17/11	II/M	17/11	MI/O		
17/11	IM/M	17/11	MM/O		
17/11	IO/M	17/11	MO/O		

Provides 27 combinations, when whorls appear in both index fingers, and middle finger of the right hand, the left middle finger not considered.

SCHEDULE—Continued

19/11	II/II	19/11	OI/IM	19/11	MI/MI	19/11	I I/M O	19/11	OI/OI	19/11	M I/O O
19/11	IM/I I	19/11	OM/I M	19/11	M M/M I	19/11	I M/M O	19/11	OM/O I	19/11	M M/O O
19/11	IO/I I	19/11	OO/I M	19/11	MO/M I	19/11	I O/M O	19/11	OO/O I	19/11	MO/O O
19/11	MI/I I	19/11	I I/I O	19/11	O I/M I	19/11	M I/M O	19/11	I I/O M	19/11	O I/O O
19/11	M M/I I	19/11	I M/I O	19/11	OM/M I	19/11	M M/M O	19/11	I M/O M	19/11	OM/O O
19/11	MO/I I	19/11	I O/I O	19/11	O O/M I	19/11	MO/M O	19/11	I O/O M	19/11	OO/O O
19/11	OI/I I	19/11	MI/I O	19/11	I I/M M	19/11	OI/M O	19/11	M I/O M		
19/11	OM/I I	19/11	M M/I O	19/11	I M/M M	19/11	OM/M O	19/11	M M/O M		
19/11	OO/I I	19/11	MO/I O	19/11	I O/M M	19/11	OO/M O	19/11	M O/O M		
19/11	I I/I M	19/11	OI/I O	19/11	M I/M M	11/19	I I/O I	19/11	O I/O M		
19/11	IM/I M	19/11	OM/I O	19/11	M M/M M	19/11	IM/O I	19/11	OM/O M		
19/11	IO/I M	19/11	OO/I O	19/11	MO/M M	19/11	I O/O I	19/11	OO/O M		
19/11	M I/I M	19/11	I I/M I	19/11	O I/M M	19/11	MI/O I	19/11	I I/O O		
19/11	M M/I M	19/11	I M/M I	19/11	OM/M M	19/11	M M/O I	19/11	I M/O O		
19/11	MO/I M	19/11	I O/M I	19/11	O O/M M	19/11	MO/O I	19/11	I O/O O		

Impressions having whorls in the index and middle fingers of both hands provide 81 combinations.

The various groups shown under the 16 primary classifications in the schedule control the classification of all impressions; being all the combinations that could possibly be formed under the Henry System of classifying, except in cases of certain primary classifications, where the accumulation is very large and is sub-divided by the experts in charge of such collection under a system of their own, and for which no rules are provided.

The order in which the various combinations follow each other in the schedule is the correct order in which impressions are to be filed.

As the finger print file consists of 1024 primary classifications and only 16 of these are represented in the schedule, it shows that each one of the said 16 governs the sub-division for 64 primary classifications, as follows:

The following primary classifications have similar sub-divisions to those shown in Schedule for $\frac{1}{1}$.

$\frac{2.}{1'}$ $\frac{5.}{1'}$ $\frac{6.}{1'}$ $\frac{9.}{1'}$ $\frac{10.}{1'}$ $\frac{13.}{1'}$ $\frac{14.}{1'}$ $\frac{1.}{2'}$ $\frac{2.}{2'}$ $\frac{5.}{2'}$ $\frac{6.}{2'}$ $\frac{9.}{2'}$ $\frac{10.}{2'}$ $\frac{13.}{2'}$ $\frac{14.}{2'}$

$\frac{1.}{5'}$ $\frac{2.}{5'}$ $\frac{5.}{5'}$ $\frac{6.}{5'}$ $\frac{9.}{5'}$ $\frac{10.}{5'}$ $\frac{13.}{5'}$ $\frac{14.}{5'}$ $\frac{1.}{6'}$ $\frac{2.}{6'}$ $\frac{5.}{6'}$ $\frac{6.}{6'}$ $\frac{9.}{6'}$ $\frac{10.}{6'}$ $\frac{13.}{6'}$ $\frac{14.}{6'}$

$\frac{1.}{17'}$ $\frac{2.}{17'}$ $\frac{5.}{17'}$ $\frac{6.}{17'}$ $\frac{9.}{17'}$ $\frac{10.}{17'}$ $\frac{13.}{17'}$ $\frac{14.}{17'}$ $\frac{1.}{18'}$ $\frac{2.}{18'}$ $\frac{5.}{18'}$ $\frac{6.}{18'}$ $\frac{9.}{18'}$ $\frac{10.}{18'}$ $\frac{13.}{18'}$ $\frac{14.}{18'}$

$\frac{1.}{21'}$ $\frac{2.}{21'}$ $\frac{5.}{21'}$ $\frac{6.}{21'}$ $\frac{9.}{21'}$ $\frac{10.}{21'}$ $\frac{13.}{21'}$ $\frac{14.}{21'}$ $\frac{1.}{22'}$ $\frac{2.}{22'}$ $\frac{5.}{22'}$ $\frac{6.}{22'}$ $\frac{9.}{22'}$ $\frac{10.}{22'}$ $\frac{13.}{22'}$ $\frac{14.}{22}$

The following primary classifications have similar sub-divisions to those shown in Schedule for $\frac{3.}{1}$.

$\frac{4.}{1'}$ $\frac{7.}{1'}$ $\frac{8.}{1'}$ $\frac{11.}{1'}$ $\frac{12.}{1'}$ $\frac{15.}{1'}$ $\frac{16.}{1'}$ $\frac{3.}{2'}$ $\frac{4.}{2'}$ $\frac{7.}{2'}$ $\frac{8.}{2'}$ $\frac{11.}{2'}$ $\frac{12.}{2'}$ $\frac{15.}{2'}$ $\frac{16.}{2'}$

$\frac{3.}{5'}$ $\frac{4.}{5'}$ $\frac{7.}{5'}$ $\frac{8.}{5'}$ $\frac{11.}{5'}$ $\frac{12.}{5'}$ $\frac{15.}{5'}$ $\frac{16.}{5'}$ $\frac{3.}{6'}$ $\frac{4.}{6'}$ $\frac{7.}{6'}$ $\frac{8.}{6'}$ $\frac{11.}{6'}$ $\frac{12.}{6'}$ $\frac{15.}{6'}$ $\frac{16.}{6'}$

$\frac{3.}{17'}$ $\frac{4.}{17'}$ $\frac{7.}{17'}$ $\frac{8.}{17'}$ $\frac{11.}{17'}$ $\frac{12.}{17'}$ $\frac{15.}{17'}$ $\frac{16.}{17'}$ $\frac{3.}{18'}$ $\frac{4.}{18'}$ $\frac{7.}{18}$ $\frac{8.}{18'}$ $\frac{11.}{18'}$ $\frac{12.}{18'}$ $\frac{15.}{18'}$ $\frac{16.}{18'}$

$\frac{3}{21'}$ $\frac{4.}{21'}$ $\frac{7.}{21'}$ $\frac{8.}{21'}$ $\frac{11.}{21'}$ $\frac{12.}{21'}$ $\frac{15.}{21'}$ $\frac{16.}{21'}$ $\frac{3.}{22'}$ $\frac{4.}{22'}$ $\frac{7.}{22'}$ $\frac{8.}{22'}$ $\frac{11.}{22'}$ $\frac{12.}{22'}$ $\frac{15.}{22'}$ $\frac{16.}{22}$

The following primary classifications have similar subdivisions to those shown in Schedule for $\frac{17}{1}$.

$\frac{18.}{1'}$ $\frac{21.}{1'}$ $\frac{22.}{1'}$ $\frac{25.}{1'}$ $\frac{26.}{1'}$ $\frac{29.}{1'}$ $\frac{30.}{1'}$ $\frac{17.}{2'}$ $\frac{18.}{2'}$ $\frac{21.}{2'}$ $\frac{22.}{2'}$ $\frac{25.}{2'}$ $\frac{26.}{2'}$ $\frac{29.}{2'}$ $\frac{30.}{2'}$

$\frac{17.}{5'}$ $\frac{18.}{5'}$ $\frac{21.}{5'}$ $\frac{22.}{5'}$ $\frac{25.}{5'}$ $\frac{26.}{5'}$ $\frac{29.}{5'}$ $\frac{30.}{5'}$ $\frac{17.}{6'}$ $\frac{18.}{6'}$ $\frac{21.}{6'}$ $\frac{22.}{6'}$ $\frac{25.}{6'}$ $\frac{26.}{6'}$ $\frac{29.}{6'}$ $\frac{30.}{6'}$

$\frac{17.}{17'}$ $\frac{18.}{17'}$ $\frac{21.}{17'}$ $\frac{22.}{17'}$ $\frac{25.}{17'}$ $\frac{26.}{17'}$ $\frac{29.}{17'}$ $\frac{30.}{17'}$ $\frac{17.}{18'}$ $\frac{18.}{18'}$ $\frac{21.}{18'}$ $\frac{22.}{18'}$ $\frac{25.}{18'}$ $\frac{26.}{18'}$ $\frac{29.}{18'}$ $\frac{30.}{18'}$

$\frac{17.}{21'}$ $\frac{18.}{21'}$ $\frac{21.}{21}$ $\frac{22.}{21'}$ $\frac{25.}{21'}$ $\frac{26.}{21'}$ $\frac{29.}{21'}$ $\frac{30.}{21'}$ $\frac{17.}{22'}$ $\frac{18.}{22'}$ $\frac{21.}{22'}$ $\frac{22.}{22'}$ $\frac{25.}{22'}$ $\frac{26.}{22'}$ $\frac{29.}{22'}$ $\frac{30.}{22}$

The following primary classifications have similar subdivisions to those shown in Schedule for $\frac{19}{1}$.

$\frac{20.}{1'}$ $\frac{23.}{1'}$ $\frac{24.}{1'}$ $\frac{27.}{1'}$ $\frac{28.}{1'}$ $\frac{31.}{1'}$ $\frac{32.}{1'}$ $\frac{19.}{2'}$ $\frac{20.}{2'}$ $\frac{23.}{2'}$ $\frac{24.}{2'}$ $\frac{27.}{2'}$ $\frac{28.}{2'}$ $\frac{31.}{2'}$ $\frac{32.}{2'}$

$\frac{19.}{5'}$ $\frac{20.}{5'}$ $\frac{23.}{5'}$ $\frac{24.}{5'}$ $\frac{27}{5'}$ $\frac{28.}{5'}$ $\frac{31.}{5'}$ $\frac{32.}{5'}$ $\frac{19.}{6'}$ $\frac{20.}{6'}$ $\frac{23.}{6'}$ $\frac{24.}{6'}$ $\frac{27.}{6'}$ $\frac{28.}{6'}$ $\frac{31.}{6'}$ $\frac{32.}{6'}$

$\frac{19.}{17'}$ $\frac{20.}{17'}$ $\frac{23.}{17'}$ $\frac{24.}{17'}$ $\frac{27.}{17'}$ $\frac{28.}{17'}$ $\frac{31.}{17'}$ $\frac{32.}{17'}$ $\frac{19.}{18'}$ $\frac{20.}{18'}$ $\frac{23.}{18'}$ $\frac{24.}{18'}$ $\frac{27.}{18'}$ $\frac{28.}{18'}$ $\frac{31.}{18'}$ $\frac{32.}{18'}$

$\frac{19.}{21'}$ $\frac{20.}{21'}$ $\frac{23.}{21'}$ $\frac{24.}{21'}$ $\frac{27.}{21'}$ $\frac{28.}{21'}$ $\frac{31.}{21'}$ $\frac{32.}{21'}$ $\frac{19.}{22'}$ $\frac{20.}{22'}$ $\frac{23.}{22'}$ $\frac{24.}{22'}$ $\frac{27.}{22'}$ $\frac{28.}{22'}$ $\frac{31.}{22'}$ $\frac{32.}{22}$

The following primary classifications have similar subdivisions to those shown in Schedule for $\frac{1}{3}$.

$\frac{2.}{3'}$ $\frac{5.}{3'}$ $\frac{6.}{3'}$ $\frac{9.}{3'}$ $\frac{10.}{3'}$ $\frac{13.}{3'}$ $\frac{14.}{3'}$ $\frac{1.}{4'}$ $\frac{2.}{4'}$ $\frac{5.}{4'}$ $\frac{6.}{4'}$ $\frac{9.}{4'}$ $\frac{10.}{4'}$ $\frac{13.}{4'}$ $\frac{14.}{4'}$

$\frac{1.}{7'}$ $\frac{2.}{7'}$ $\frac{5.}{7'}$ $\frac{6.}{7'}$ $\frac{9.}{7'}$ $\frac{10.}{7'}$ $\frac{13.}{7'}$ $\frac{14.}{7'}$ $\frac{1.}{8'}$ $\frac{2.}{8'}$ $\frac{5.}{8'}$ $\frac{6.}{8'}$ $\frac{9.}{8'}$ $\frac{10.}{8'}$ $\frac{13.}{8'}$ $\frac{14.}{8'}$

$\frac{1.}{19'}$ $\frac{2.}{19'}$ $\frac{5.}{19'}$ $\frac{6.}{19'}$ $\frac{9.}{19'}$ $\frac{10.}{19'}$ $\frac{13.}{19'}$ $\frac{14.}{19'}$ $\frac{1.}{20'}$ $\frac{2.}{20'}$ $\frac{5.}{20'}$ $\frac{6.}{20'}$ $\frac{9.}{20'}$ $\frac{10.}{20'}$ $\frac{13.}{20'}$ $\frac{14.}{20'}$

$\frac{1.}{23'}$ $\frac{2.}{23'}$ $\frac{5.}{23'}$ $\frac{6.}{23'}$ $\frac{9.}{23'}$ $\frac{10.}{23'}$ $\frac{13.}{23'}$ $\frac{14.}{23'}$ $\frac{1.}{24'}$ $\frac{2.}{24'}$ $\frac{5.}{24'}$ $\frac{6.}{24'}$ $\frac{9.}{24'}$ $\frac{10.}{24'}$ $\frac{13.}{24'}$ $\frac{14.}{24}$

The following primary classifications have similar subdivisions to those shown in Schedule for $\frac{3}{3}$.

$\frac{4.}{3'}$ $\frac{7.}{3'}$ $\frac{8.}{3'}$ $\frac{11.}{3'}$ $\frac{12.}{3'}$ $\frac{15.}{3'}$ $\frac{16.}{3'}$ $\frac{3.}{4'}$ $\frac{4.}{4'}$ $\frac{7.}{4'}$ $\frac{8.}{4'}$ $\frac{11.}{4'}$ $\frac{12.}{4'}$ $\frac{15.}{4'}$ $\frac{16.}{4'}$

$\frac{3.}{7'}$ $\frac{4.}{7'}$ $\frac{7.}{7'}$ $\frac{8.}{7}$ $\frac{11.}{7'}$ $\frac{12.}{7'}$ $\frac{15.}{7'}$ $\frac{16.}{7'}$ $\frac{3.}{8'}$ $\frac{4.}{8'}$ $\frac{7.}{8'}$ $\frac{8.}{8'}$ $\frac{11.}{8'}$ $\frac{12.}{8'}$ $\frac{15.}{8'}$ $\frac{16.}{8'}$

$\frac{3.}{19'}$ $\frac{4.}{19'}$ $\frac{7.}{19'}$ $\frac{8.}{19'}$ $\frac{11.}{19'}$ $\frac{12.}{19'}$ $\frac{15.}{19'}$ $\frac{16.}{19'}$ $\frac{3.}{20'}$ $\frac{4.}{20'}$ $\frac{7.}{20'}$ $\frac{8.}{20'}$ $\frac{11.}{20'}$ $\frac{12.}{20'}$ $\frac{15.}{20'}$ $\frac{16.}{20'}$

$\frac{3.}{23'}$ $\frac{4.}{23'}$ $\frac{7.}{23'}$ $\frac{8.}{23'}$ $\frac{11.}{23'}$ $\frac{12.}{23'}$ $\frac{15}{23'}$ $\frac{16.}{23'}$ $\frac{3.}{24'}$ $\frac{4.}{24'}$ $\frac{7.}{24'}$ $\frac{8.}{24'}$ $\frac{11.}{24'}$ $\frac{12.}{24'}$ $\frac{15.}{24'}$ $\frac{16.}{24}$

The following primary classifications have similar subdivisions to those shown in Schedule for $\frac{17}{3}$.

$\frac{18.}{3'}$ $\frac{21.}{3'}$ $\frac{22.}{3'}$ $\frac{25.}{3'}$ $\frac{26.}{3'}$ $\frac{29.}{3'}$ $\frac{30.}{3'}$ $\frac{17.}{4'}$ $\frac{18.}{4'}$ $\frac{21.}{4'}$ $\frac{22.}{4'}$ $\frac{25.}{4'}$ $\frac{26.}{4'}$ $\frac{29.}{4'}$ $\frac{30.}{4'}$

$\frac{17.}{7'}$ $\frac{18.}{7'}$ $\frac{21.}{7'}$ $\frac{22.}{7'}$ $\frac{25.}{7'}$ $\frac{26.}{7'}$ $\frac{29.}{7'}$ $\frac{30.}{7'}$ $\frac{17.}{8'}$ $\frac{18.}{8'}$ $\frac{21.}{8'}$ $\frac{22.}{8'}$ $\frac{25.}{8'}$ $\frac{26.}{8'}$ $\frac{29.}{8'}$ $\frac{30.}{8'}$

$\frac{17.}{19'}$ $\frac{18.}{19'}$ $\frac{21.}{19'}$ $\frac{22.}{19'}$ $\frac{25.}{19'}$ $\frac{26.}{19'}$ $\frac{29.}{19'}$ $\frac{30.}{19'}$ $\frac{17.}{20'}$ $\frac{18.}{20'}$ $\frac{21.}{20'}$ $\frac{22.}{20'}$ $\frac{25.}{20'}$ $\frac{26.}{20'}$ $\frac{29.}{20'}$ $\frac{30.}{20'}$

$\frac{17.}{23'}$ $\frac{18.}{23'}$ $\frac{21.}{23'}$ $\frac{22.}{23'}$ $\frac{25.}{23'}$ $\frac{26.}{23'}$ $\frac{29.}{23'}$ $\frac{30.}{23'}$ $\frac{17.}{24'}$ $\frac{18.}{24'}$ $\frac{21.}{24'}$ $\frac{22.}{24'}$ $\frac{25.}{24'}$ $\frac{26.}{24'}$ $\frac{29.}{24'}$ $\frac{30.}{24}$

The following primary classifications have similar subdivisions to those shown in Schedule for $\frac{19}{3}$.

$\frac{20.}{3'}$ $\frac{23.}{3'}$ $\frac{24.}{3'}$ $\frac{27.}{3'}$ $\frac{28.}{3'}$ $\frac{31.}{3'}$ $\frac{32.}{3'}$ $\frac{19.}{4'}$ $\frac{20.}{4'}$ $\frac{23.}{4'}$ $\frac{24.}{4'}$ $\frac{27.}{4'}$ $\frac{28.}{4'}$ $\frac{31.}{4'}$ $\frac{32.}{4'}$

$\frac{19.}{7'}$ $\frac{20.}{7'}$ $\frac{23.}{7'}$ $\frac{24.}{7'}$ $\frac{27.}{7'}$ $\frac{28.}{7'}$ $\frac{31.}{7'}$ $\frac{32.}{7'}$ $\frac{19.}{8'}$ $\frac{20.}{8'}$ $\frac{23.}{8'}$ $\frac{24.}{8'}$ $\frac{27.}{8'}$ $\frac{28.}{8'}$ $\frac{31.}{8'}$ $\frac{32.}{8'}$

$\frac{19.}{19'}$ $\frac{20.}{19'}$ $\frac{23.}{19'}$ $\frac{24.}{19'}$ $\frac{27.}{19'}$ $\frac{28.}{19'}$ $\frac{31.}{19'}$ $\frac{32.}{19'}$ $\frac{19.}{20'}$ $\frac{20.}{20'}$ $\frac{23.}{20'}$ $\frac{24.}{20'}$ $\frac{27.}{20'}$ $\frac{28.}{20'}$ $\frac{31.}{20'}$ $\frac{32.}{20'}$

$\frac{19.}{23'}$ $\frac{20.}{23'}$ $\frac{23.}{23'}$ $\frac{24.}{23'}$ $\frac{27.}{23'}$ $\frac{28.}{23'}$ $\frac{31.}{23'}$ $\frac{32.}{23'}$ $\frac{19.}{24'}$ $\frac{20.}{24'}$ $\frac{23.}{24'}$ $\frac{24.}{24'}$ $\frac{27.}{24'}$ $\frac{28.}{24'}$ $\frac{31.}{24'}$ $\frac{32.}{24}$

The following primary classifications have similar subdivisions to those shown in Schedule for $\frac{1}{9}$.

$\frac{2.}{9'}$ $\frac{5.}{9'}$ $\frac{6.}{9'}$ $\frac{9.}{9'}$ $\frac{10.}{9'}$ $\frac{13.}{9'}$ $\frac{14.}{9'}$ $\frac{1.}{10'}$ $\frac{2.}{10'}$ $\frac{5.}{10'}$ $\frac{6.}{10'}$ $\frac{9.}{10'}$ $\frac{10.}{10'}$ $\frac{13.}{10'}$ $\frac{14.}{10'}$

$\frac{1.}{13'}$ $\frac{2.}{13'}$ $\frac{5.}{13'}$ $\frac{6.}{13'}$ $\frac{9.}{13'}$ $\frac{10.}{13'}$ $\frac{13.}{13'}$ $\frac{14.}{13'}$ $\frac{1.}{14'}$ $\frac{2.}{14'}$ $\frac{5.}{14'}$ $\frac{6.}{14'}$ $\frac{9.}{14'}$ $\frac{10.}{14'}$ $\frac{13.}{14'}$ $\frac{14.}{14'}$

$\frac{1.}{25'}$ $\frac{2.}{25'}$ $\frac{5.}{25'}$ $\frac{6.}{25'}$ $\frac{9.}{25'}$ $\frac{10.}{25'}$ $\frac{13.}{25}$ $\frac{14.}{25'}$ $\frac{1.}{26'}$ $\frac{2.}{26'}$ $\frac{5.}{26'}$ $\frac{6.}{26'}$ $\frac{9.}{26'}$ $\frac{10.}{26'}$ $\frac{13.}{26'}$ $\frac{14.}{26'}$

$\frac{1.}{29'}$ $\frac{2.}{29'}$ $\frac{5.}{29'}$ $\frac{6.}{29'}$ $\frac{9.}{29'}$ $\frac{10.}{29'}$ $\frac{13.}{29'}$ $\frac{14.}{29'}$ $\frac{1.}{30'}$ $\frac{2.}{30'}$ $\frac{5.}{30'}$ $\frac{6.}{30'}$ $\frac{9.}{30'}$ $\frac{10.}{30'}$ $\frac{13.}{30'}$ $\frac{14.}{30}$

The following primary classifications have similar subdivisions to those shown in Schedule for $\frac{3}{9}$.

$\frac{4.}{9'}$ $\frac{7.}{9'}$ $\frac{8.}{9'}$ $\frac{11.}{9'}$ $\frac{12.}{9'}$ $\frac{15.}{9'}$ $\frac{16.}{9'}$ $\frac{3.}{10'}$ $\frac{4.}{10'}$ $\frac{7.}{10'}$ $\frac{8.}{10'}$ $\frac{11.}{10'}$ $\frac{12.}{10'}$ $\frac{15.}{10'}$ $\frac{16.}{10'}$

$\frac{3.}{13'}$ $\frac{4.}{13'}$ $\frac{7.}{13'}$ $\frac{8.}{13'}$ $\frac{11.}{13'}$ $\frac{12.}{13'}$ $\frac{15.}{13'}$ $\frac{16.}{13'}$ $\frac{3.}{14'}$ $\frac{4.}{14'}$ $\frac{7.}{14'}$ $\frac{8.}{14'}$ $\frac{11.}{14'}$ $\frac{12.}{14'}$ $\frac{15.}{14'}$ $\frac{16.}{14'}$

$\frac{3.}{25'}$ $\frac{4.}{25'}$ $\frac{7.}{25'}$ $\frac{8.}{25'}$ $\frac{11.}{25'}$ $\frac{12.}{25'}$ $\frac{15.}{25'}$ $\frac{16.}{25'}$ $\frac{3.}{26'}$ $\frac{4.}{26'}$ $\frac{7.}{26'}$ $\frac{8.}{26'}$ $\frac{11.}{26'}$ $\frac{12.}{26'}$ $\frac{15.}{26'}$ $\frac{16.}{26'}$

$\frac{3.}{29'}$ $\frac{4.}{29'}$ $\frac{7.}{29'}$ $\frac{8.}{29'}$ $\frac{11.}{29'}$ $\frac{12.}{29'}$ $\frac{15.}{29'}$ $\frac{16.}{29'}$ $\frac{3.}{30'}$ $\frac{4.}{30'}$ $\frac{7.}{30'}$ $\frac{8.}{30'}$ $\frac{11.}{30'}$ $\frac{12.}{30'}$ $\frac{15.}{30'}$ $\frac{16.}{30}$

The following primary classifications have similar subdivisions to those shown in Schedule for $\frac{17}{9}$.

$\frac{18.}{9'}$ $\frac{21.}{9'}$ $\frac{22.}{9'}$ $\frac{25.}{9'}$ $\frac{26.}{9'}$ $\frac{29.}{9'}$ $\frac{30.}{9'}$ $\frac{17.}{10'}$ $\frac{18.}{10'}$ $\frac{21.}{10'}$ $\frac{22.}{10'}$ $\frac{25.}{10'}$ $\frac{26.}{10'}$ $\frac{29.}{10'}$ $\frac{30.}{10'}$

$\frac{17.}{13'}$ $\frac{18.}{13'}$ $\frac{21.}{13'}$ $\frac{22.}{13'}$ $\frac{25.}{13'}$ $\frac{26.}{13'}$ $\frac{29.}{13'}$ $\frac{30.}{13'}$ $\frac{17.}{14'}$ $\frac{18.}{14'}$ $\frac{21.}{14'}$ $\frac{22.}{14'}$ $\frac{25.}{14'}$ $\frac{26.}{14'}$ $\frac{29.}{14'}$ $\frac{30.}{14'}$

$\frac{17.}{25'}$ $\frac{18.}{25'}$ $\frac{21.}{25'}$ $\frac{22.}{25'}$ $\frac{25.}{25'}$ $\frac{26.}{25'}$ $\frac{29.}{25'}$ $\frac{30.}{25'}$ $\frac{17.}{26'}$ $\frac{18.}{26'}$ $\frac{21.}{26'}$ $\frac{22.}{26'}$ $\frac{25.}{26'}$ $\frac{26.}{26'}$ $\frac{29.}{26'}$ $\frac{30.}{26'}$

$\frac{17.}{29'}$ $\frac{18.}{29'}$ $\frac{21.}{29'}$ $\frac{22.}{29'}$ $\frac{25.}{29'}$ $\frac{26.}{29'}$ $\frac{29.}{29'}$ $\frac{30.}{29'}$ $\frac{17.}{30'}$ $\frac{18.}{30'}$ $\frac{21.}{30'}$ $\frac{22.}{30'}$ $\frac{25.}{30'}$ $\frac{26.}{30'}$ $\frac{29.}{30'}$ $\frac{30.}{30}$

The following primary classifications have similar subdivisions to those shown in Schedule for $\frac{19}{9}$.

$\frac{20.}{9'}$ $\frac{23.}{9'}$ $\frac{24.}{9'}$ $\frac{27.}{9'}$ $\frac{28.}{9'}$ $\frac{31.}{9'}$ $\frac{32.}{9'}$ $\frac{19.}{10'}$ $\frac{20.}{10'}$ $\frac{23.}{10'}$ $\frac{24.}{10'}$ $\frac{27.}{10'}$ $\frac{28.}{10'}$ $\frac{31.}{10'}$ $\frac{32.}{10'}$

$\frac{19.}{13'}$ $\frac{20.}{13'}$ $\frac{23.}{13'}$ $\frac{24.}{13'}$ $\frac{27.}{13'}$ $\frac{28.}{13'}$ $\frac{31.}{13'}$ $\frac{32.}{13'}$ $\frac{19.}{14'}$ $\frac{20.}{14'}$ $\frac{23.}{14'}$ $\frac{24.}{14'}$ $\frac{27.}{14'}$ $\frac{28.}{14'}$ $\frac{31.}{14'}$ $\frac{32.}{14'}$

$\frac{19.}{25'}$ $\frac{20.}{25'}$ $\frac{23.}{25'}$ $\frac{24.}{25'}$ $\frac{27.}{25'}$ $\frac{28.}{25'}$ $\frac{31.}{25'}$ $\frac{32.}{25'}$ $\frac{19.}{26'}$ $\frac{20.}{26'}$ $\frac{23.}{26'}$ $\frac{24.}{26'}$ $\frac{27.}{26'}$ $\frac{28.}{26'}$ $\frac{31.}{26'}$ $\frac{32.}{26'}$

$\frac{19.}{29'}$ $\frac{20.}{29'}$ $\frac{23.}{29'}$ $\frac{24.}{29'}$ $\frac{27.}{29'}$ $\frac{28.}{29'}$ $\frac{31.}{29'}$ $\frac{32.}{29'}$ $\frac{19.}{30'}$ $\frac{20.}{30}$ $\frac{23.}{30'}$ $\frac{24.}{30'}$ $\frac{27.}{30'}$ $\frac{28.}{30'}$ $\frac{31.}{30'}$ $\frac{32.}{30}$

The following primary classifications have similar subdivisions to those shown in Schedule for $\frac{1}{11}$.

$\frac{2.}{11'}$ $\frac{5.}{11'}$ $\frac{6.}{11'}$ $\frac{9.}{11'}$ $\frac{10.}{11'}$ $\frac{13.}{11'}$ $\frac{14.}{11'}$ $\frac{1.}{12'}$ $\frac{2.}{12'}$ $\frac{5.}{12'}$ $\frac{6.}{12'}$ $\frac{9.}{12'}$ $\frac{10.}{12'}$ $\frac{13.}{12'}$ $\frac{14.}{12'}$

$\frac{1.}{15'}$ $\frac{2.}{15'}$ $\frac{5.}{15'}$ $\frac{6.}{15'}$ $\frac{9.}{15'}$ $\frac{10.}{15'}$ $\frac{13.}{15'}$ $\frac{14.}{15'}$ $\frac{1.}{16'}$ $\frac{2.}{16}$ $\frac{5.}{16'}$ $\frac{6.}{16'}$ $\frac{9.}{16'}$ $\frac{10.}{16'}$ $\frac{13.}{16'}$ $\frac{14.}{16'}$

$\frac{1.}{27'}$ $\frac{2.}{27'}$ $\frac{5.}{27'}$ $\frac{6.}{27'}$ $\frac{9.}{27'}$ $\frac{10.}{27'}$ $\frac{13.}{27'}$ $\frac{14.}{27'}$ $\frac{1.}{28'}$ $\frac{2.}{28'}$ $\frac{5.}{28'}$ $\frac{6.}{28'}$ $\frac{9.}{28'}$ $\frac{10.}{28'}$ $\frac{13.}{28'}$ $\frac{14.}{28'}$

$\frac{1.}{31'}$ $\frac{2.}{31'}$ $\frac{5.}{31'}$ $\frac{6.}{31'}$ $\frac{9.}{31'}$ $\frac{10.}{31'}$ $\frac{13.}{31'}$ $\frac{14.}{31'}$ $\frac{1.}{32'}$ $\frac{2.}{32'}$ $\frac{5.}{32'}$ $\frac{6.}{32'}$ $\frac{9.}{32'}$ $\frac{10.}{32'}$ $\frac{13.}{32'}$ $\frac{14.}{32}$

The following primary classifications have similar subdivisions to those shown in Schedule for $\frac{3}{11}$.

$\frac{4.}{11'}$ $\frac{7.}{11'}$ $\frac{8.}{11'}$ $\frac{11.}{11'}$ $\frac{12.}{11'}$ $\frac{15.}{11'}$ $\frac{16.}{11'}$ $\frac{3.}{12'}$ $\frac{4.}{12'}$ $\frac{7.}{12'}$ $\frac{8.}{12'}$ $\frac{11.}{12'}$ $\frac{12.}{12'}$ $\frac{15.}{12'}$ $\frac{16.}{12'}$

$\frac{3.}{15'}$ $\frac{4.}{15'}$ $\frac{7.}{15'}$ $\frac{8.}{15'}$ $\frac{11.}{15'}$ $\frac{12.}{15'}$ $\frac{15.}{15'}$ $\frac{16.}{15'}$ $\frac{3.}{16'}$ $\frac{4.}{16'}$ $\frac{7.}{16'}$ $\frac{8.}{16'}$ $\frac{11.}{16'}$ $\frac{12.}{16'}$ $\frac{15.}{16'}$ $\frac{16.}{16'}$

$\frac{3.}{27'}$ $\frac{4.}{27'}$ $\frac{7.}{27'}$ $\frac{8.}{27'}$ $\frac{11.}{27'}$ $\frac{12.}{27'}$ $\frac{15.}{27'}$ $\frac{16.}{27'}$ $\frac{3.}{28'}$ $\frac{4.}{28'}$ $\frac{7.}{28'}$ $\frac{8.}{28'}$ $\frac{11.}{28'}$ $\frac{12.}{28'}$ $\frac{15.}{28'}$ $\frac{16.}{28'}$

$\frac{3.}{31'}$ $\frac{4.}{31'}$ $\frac{7.}{31'}$ $\frac{8.}{31'}$ $\frac{11}{31'}$ $\frac{12.}{31'}$ $\frac{15.}{31'}$ $\frac{16.}{31'}$ $\frac{3.}{32'}$ $\frac{4.}{32'}$ $\frac{7.}{32'}$ $\frac{8.}{32'}$ $\frac{11.}{32'}$ $\frac{12.}{32'}$ $\frac{15.}{32'}$ $\frac{16.}{32}$

The following primary classifications have similar subdivisions to those shown in Schedule for $\frac{17.}{11}$.

$\frac{18.}{11'}$ $\frac{21.}{11'}$ $\frac{22.}{11'}$ $\frac{25.}{11'}$ $\frac{26.}{11'}$ $\frac{29.}{11'}$ $\frac{30.}{11'}$ $\frac{17.}{12'}$ $\frac{18.}{12'}$ $\frac{21.}{12'}$ $\frac{22.}{12'}$ $\frac{25.}{12'}$ $\frac{26.}{12'}$ $\frac{29.}{12'}$ $\frac{30.}{12'}$

$\frac{17.}{15'}$ $\frac{18.}{15'}$ $\frac{21.}{15'}$ $\frac{22.}{15'}$ $\frac{25.}{15'}$ $\frac{26.}{15'}$ $\frac{29.}{15'}$ $\frac{30.}{15'}$ $\frac{17.}{16'}$ $\frac{18.}{16'}$ $\frac{21.}{16'}$ $\frac{22.}{16'}$ $\frac{25.}{16'}$ $\frac{26.}{16'}$ $\frac{29.}{16'}$ $\frac{30.}{16'}$

$\frac{17.}{27'}$ $\frac{18.}{27'}$ $\frac{21.}{27'}$ $\frac{22.}{27'}$ $\frac{25.}{27'}$ $\frac{26.}{27'}$ $\frac{29.}{27'}$ $\frac{30.}{27'}$ $\frac{17.}{28'}$ $\frac{18.}{28'}$ $\frac{21.}{28'}$ $\frac{22.}{28'}$ $\frac{25.}{28'}$ $\frac{26.}{28'}$ $\frac{29.}{28'}$ $\frac{30.}{28'}$

$\frac{17.}{31'}$ $\frac{18.}{31'}$ $\frac{21.}{31'}$ $\frac{22.}{31'}$ $\frac{25.}{31'}$ $\frac{26.}{31'}$ $\frac{29.}{31'}$ $\frac{30.}{31'}$ $\frac{17.}{32'}$ $\frac{18.}{32'}$ $\frac{21.}{32'}$ $\frac{22.}{32'}$ $\frac{25.}{32'}$ $\frac{26.}{32'}$ $\frac{29.}{32'}$ $\frac{30.}{32}$

The following primary classifications have similar subdivisions to those shown in Schedule for $\frac{19.}{11}$.

$\frac{20.}{11'}$ $\frac{23.}{11'}$ $\frac{24.}{11'}$ $\frac{27.}{11'}$ $\frac{28.}{11'}$ $\frac{31.}{11'}$ $\frac{32.}{11'}$ $\frac{19.}{12'}$ $\frac{20.}{12'}$ $\frac{23.}{12'}$ $\frac{24.}{12'}$ $\frac{27.}{12'}$ $\frac{28.}{12'}$ $\frac{31.}{12'}$ $\frac{32.}{12'}$

$\frac{19.}{15'}$ $\frac{20.}{15'}$ $\frac{23.}{15'}$ $\frac{24.}{15'}$ $\frac{27.}{15'}$ $\frac{28.}{15'}$ $\frac{31.}{15'}$ $\frac{32.}{15'}$ $\frac{19.}{16'}$ $\frac{20.}{16'}$ $\frac{23.}{16'}$ $\frac{24.}{16'}$ $\frac{27.}{16'}$ $\frac{28.}{16'}$ $\frac{31.}{16'}$ $\frac{32.}{16'}$

$\frac{19.}{27'}$ $\frac{20.}{27'}$ $\frac{23.}{27'}$ $\frac{24.}{27'}$ $\frac{27.}{27'}$ $\frac{28.}{27'}$ $\frac{31.}{27'}$ $\frac{32.}{27'}$ $\frac{19.}{28'}$ $\frac{20.}{28'}$ $\frac{23.}{28'}$ $\frac{24.}{28'}$ $\frac{27.}{28'}$ $\frac{28.}{28'}$ $\frac{31.}{28'}$ $\frac{32.}{28'}$

$\frac{19.}{31'}$ $\frac{20.}{31'}$ $\frac{23.}{31'}$ $\frac{24.}{31'}$ $\frac{27.}{31'}$ $\frac{28.}{31'}$ $\frac{31.}{31'}$ $\frac{32.}{31'}$ $\frac{19.}{32'}$ $\frac{20.}{32'}$ $\frac{23.}{32'}$ $\frac{24.}{32'}$ $\frac{27.}{32'}$ $\frac{28.}{32'}$ $\frac{31.}{32'}$ $\frac{32.}{32}$

This represents the 1024 primary classifications, or 16 groups of 64 each. While the schedule of combinations shows classifications that might never appear in some collections, it is arranged so that it can be used for the smallest, as well as the largest, possible collection.

Preparing Impressions for Court. Fig. 47 is an enlarged finger print showing the manner in which an impression is prepared when it is to be used in a court, where the case at issue is based on finger print testimony. By this mode of showing the points or characteristics of the original print which compare with the same points in an impression left behind by a person in the

commission of a crime, it makes it comparatively easy to convince a jury that the person on trial is guilty and that finger print testimony is reliable and conclusive.

While the preparation of finger impressions as shown above is only required at the present time in police cases, still it will act as an aid to students, or persons interested in the system of

FIG. 47

finger printing, by familiarizing them with the various characteristic points that may be used in comparing impressions.

Numbers 1, 5, 33 and 34 are described as short ridge lines; 2, 9, 14, 16, 19, 20, 22, 25 and 32 as a bifurcation of ridges; 3, 4, 6, 7, 8, 10, 11, 13, 17, 18, 21, 23, 24, 27, 28, 29, 30 and 31 as

abrupt ending ridges; 15 and 26 are called islands; and 12 shows several small ridge dots and ridge terminations caused by a cut.

In some of the European cities the impressions of the palms of the hands are also utilized as an additional means of identification, since numerous patterns and characteristics appear in the palms as well as in the fingers. In Fig. 48, which is an impression of the palm (taken over a rounded surface to insure a clear print of the entire surface), a whorl and loop are clearly

FIG. 48

shown. The deep creases shown in this print (caused by the continuous closing of the hand) might safely be used as a point

of comparison, as it is hardly possible that these creases (which are formed in childhood) will ever change, except perhaps in

FIG. 49

cases where the palm of the hand becomes scarred or mutilated through an injury.

Developing or Powdering Impressions. After the com-

mission of a crime it is immediately investigated by members of the detective force, who visit the premises for the purpose of securing evidence, such as finger impressions left unconsciously on various articles of chinaware, glassware or silverware, or on other polished surfaces by the person committing the crime.

If there are evidences of finger impressions, an expert is notified to visit the premises for the purpose of developing or powdering these impressions, so that they may be photographed for future use, or until such time as the person to whom said prints belong is arrested.

The manner in which impressions are developed is by sprinkling the powder on the article with a very fine camel's hair brush, after which it is brushed lightly to remove the surplus powder, great care being taken not to brush too hard and thereby remove the powder adhering to the greasy ridges which are left by reason of the moisture that is always in evidence on the ridge surfaces of the hands. For silverware, nickelware, glass, dark polished surfaces, etc., a gray powder, known as "Chemist's Gray Powder" (mercury with chalk), is used; for paper, white surfaces, chinaware, etc., graphite, fine charcoal or ordinary lampblack may be used.

Duration of Impressions on Glass, etc. From time to time, when finger impressions were placed in evidence in the courts, the question arose as to how long an impression on glass, etc., would last, so that the powder will adhere to same sufficiently to make a positive identification; but as no actual test to determine the life of an impression of this kind has been made, so far as the finger print records are concerned, finger print experts when testifying in court have attempted a guess, giving 48 hours as the time limit, and stating that after that period a print would be entirely obliterated.

In order to place this matter on record, and to prove that the testimony of the experts has been incorrect and given without actual knowledge from practical test, and that the life of an impression left under such circumstances depends entirely upon the amount of moisture on the ridges (some persons having more than others) and upon the condition of the atmosphere, a practical test has been made, as shown by Figs. 49 and 50.

Fig. 49*a* is an impression taken with printers' ink, with which

FIG. 50

a

b

c

d

e

f

g

to compare prints, *b*, *c*, *d*, *e* and *f*, which were placed on a ferrotype plate on the same day (August 17, 1913).

b was powdered immediately after placing the impressions on said plate;

c was powdered on August 20, 1913, or 3 days after *b*;

d on August 23, 1913, or 6 days after *b*;

e on August 27, 1913, or 10 days after *b*; and

f on September 7, 1913, or 21 days after *b*; either of these impressions shows a sufficient number of characteristics to make a positive identification.

Fig. 50 shows seven impressions placed on a piece of glass on the same day (October 4, 1913) and powdered at various times to determine the life of an impression left on glass, silverware, etc.

a was powdered on October 4, 1913, or the same day that prints were placed on said glass;

b powdered October 19, 1913, or 15 days later than *a*;

c powdered November 3, 1913, or 30 days later than *a*;

d powdered November 18, 1913, or 45 days later than *a*;

e powdered December 3, 1913, or 60 days later than *a*;

f powdered December 18, 1913, or 75 days later than *a*; and

g powdered January 2, 1914, or 90 days later than *a*.

By examining the impressions shown in Fig. 50 it will be noticed that the last impression is just as clear as the first, and in fact clearer than the second and third prints. This positively proves that the contention of some finger print experts, that an impression cannot be powdered after 48 hours, is incorrect.

PART III.

PART III.

Combinations. Before entering upon the matter of questions and answers, which are intended as an aid to prospective finger print experts, an endeavor will be made to explain the meaning of combinations, as referred to by the writer and by the Civil Service Commission in examinations for "Finger Print Expert."

Combinations are really classifications, and their use recently in an examination was intended to show how many different combinations or classifications could be formed for impressions having questionable marks or patterns, and thereby to determine the ability of the candidate in making a search of the files. As explained under the heading of Classifying Impressions, the patterns are marked just what they seem to be and questioned if there is any doubt; this naturally necessitates looking up the print, first as it is marked, and then if not found it is looked up under the classification of the question mark; an impression with one question has two combinations or classifications, first without the question and second with the question considered. When two questions appear in a print it makes four combinations, one without question, one with the first question, one with the second question, and one with both questions, as in the following example:

	I? M			
W	W	\	W	W
	I? O			
W	/	W	/	W

$\frac{32}{21}\frac{I}{I}$ First Combination; (under which it is filed)

$\frac{32}{21}\frac{M}{I}$ Second " (first question)

$\frac{32}{21}\frac{I}{O}$ Third " (second question)

$\frac{32}{21}\frac{M}{O}$ Fourth " (both questions together)

The above classifications show four combinations, the result of question marks. If one of the patterns were questionable it would create additional combinations by changing the primary classification.

	(1) I?M	(2) O?M		10	Right Hand
\	w	w	\	\	
	O?M (3)	O?M (4)			Left Hand
w	w	w	w	/	

An impression having the formulae as shown above, with the four whorls (which are used for the result of the secondary classification) questioned, would give the following sixteen combinations or classifications under which a search of the files would have to be made; the numerals on the left hand side showing the order in which the combinations are arranged for filing, and the numerals on the right hand side representing the four questions, viz.:

14.	23/12	I O / O O	10	Classification under which it is filed.
16.	23/12	M O / O O	10	Question No. 1 considered.
13.	23/12	I M / O O	10	" No. 2 "
15.	23/12	M M / O O	10	Questions No. 1 and No. 2 considered together.
6.	23/12	I O / M O	10	Question No. 3 considered.
8.	23/12	M O / M O	10	Questions No. 1 and No. 3 considered together.
5.	23/12	I M / M O	10	Questions No. 2 and No. 3 considered together.
7.	23/12	M M / M O	10	Questions Nos. 1, 2, and 3 considered together.
10.	23/12	I O / O M	10	Question No. 4 considered.
12.	23/12	M O / O M	10	Questions Nos. 1 and 4 considered together.
9.	23/12	I M / O M	10	Questions Nos. 2 and 4 considered together.
11.	23/12	M M / O M	10	Questions Nos. 1, 2, and 4 considered together.
2.	23/12	I O / M M	10	Questions Nos. 3 and 4 considered together.
4.	23/12	M O / M M	10	Questions Nos. 1, 3, and 4 considered together.
1.	23/12	I M / M M	10	Questions Nos. 2, 3, and 4 considered together.
3.	23/12	M M / M M	10	Questions Nos. 1, 2, 3, and 4 considered together.

If the whorl in the left thumb were a central pocket loop, which was questioned (in addition to the other four questions) as a loop, it would give an additional 16 combinations or a total of 32 combinations, by reason of changing the primary classification from $\frac{23}{12}$ to $\frac{19}{12}$, the secondary classifications as shown above being the same under both of the primary classifications.

Impressions having amputations might also be placed in the same class as questionable prints, for the reason that they present various combinations or classifications, under which a search is made, as explained under "Classifying Missing and Deformed Fingers," as follows:

Each finger taken individually represents two changes in the primary classification when amputated (under numerical group and under those without numerical value), and as each additional amputated finger is considered, it doubles the previous number of primary classifications, viz.: First finger 2; second finger 2 by 2 makes 4; third finger 2 by 4 makes 8; fourth finger 2 by 8 makes 16; and fifth finger 2 by 16 makes 32; showing that there are 32 variations in the primary classifications for each hand, and 32 by 32 making the 1024 variations when both hands are considered.

An impression having the right hand amputated, with a whorl in the left thumb, and the remaining four fingers ulnar loops, would give the following 32 primary classifications, under which the same should be properly searched:

$\frac{5}{1}$, $\frac{13}{1}$, $\frac{21}{1}$, $\frac{29}{1}$, $\frac{5}{5}$, $\frac{13}{5}$, $\frac{21}{5}$, $\frac{29}{5}$,

$\frac{5}{9}$, $\frac{13}{9}$, $\frac{21}{9}$, $\frac{29}{9}$, $\frac{5}{13}$, $\frac{13}{13}$, $\frac{21}{13}$, $\frac{29}{13}$,

$\frac{5}{17}$, $\frac{13}{17}$, $\frac{21}{17}$, $\frac{29}{17}$, $\frac{5}{21}$, $\frac{13}{21}$, $\frac{21}{21}$, $\frac{29}{21}$,

$\frac{5}{25}$, $\frac{13}{25}$, $\frac{21}{25}$, $\frac{29}{25}$, $\frac{5}{29}$, $\frac{13}{29}$, $\frac{21}{29}$, $\frac{29}{29}$

$\frac{5}{17}$ is the primary classification under which it would be filed, if not already filed as amputated.

Questions and Answers

Q. In what respect does the testimony of a finger print expert differ from that of a handwriting expert?

A. The testimony of a finger print expert is based upon the characteristic points appearing in an impression, and is conclusive, for the reason that such impression is from the body and cannot be disputed; while the testimony of a handwriting expert is merely his individual opinion, and is based upon the similarity of the formation of letters, which is not conclusive, and leaves an opening for contradiction.

Q. What are finger impressions?

A. They are reproductions of the ridge surface of the outer or nail joint of the fingers.

Q. On what part or parts of the body does ridge formation present itself?

A. On the soles of the feet and the inner surface of the hands.

Q. Give your reasons for the appearance of ridge formation on certain parts of the body?

A. It assists the sense of touch, raises the mouths of the ducts or sweat glands to facilitate the discharge of sweat, strengthens the skin so as to withstand the wear and tear to which these parts are subjected, and creates suction by reason of the alternated ridges and depressions, thereby preventing articles from slipping from the grasp.

Q. To what may these ridges and depressions be likened or compared, and why?

A. To corrugated articles, such as sheet iron, cardboard, etc., all being used on account of the added strength; also to the soles of rubbers and rubber boots, to bicycle and automobile tires, etc., all being corrugated in some form, not only to strengthen them, but also to prevent slipping or skidding.

Q. In finger impressions, what do the black lines represent?

A. The ridges.

Q. What do the white lines represent?

A. The depressions.

Q. Why do the black lines represent the ridges and the white lines the depressions in finger prints?

A. Because the ink adheres to the raised portions (which in finger impressions are the ridges), and not to the depressions, thereby causing the blank spaces between.

Q. In what respect, if any, does the finger impression of a monkey differ from that of a human being?

A. There is no difference so far as the formation of patterns and characteristics are concerned.

Q. When does ridge formation make its first appearance in human beings?

A. At birth.

Q. During what period of time can finger impressions of individuals be taken?

A. From birth until decomposition sets in after death.

Q. What changes take place in the ridge formation of impressions, from infancy to maturity?

A. So far as formation of pattern, number of ridges, and ridge characteristics are concerned there is no change, but the pattern and ridges increase in size in proportion with other parts of the body.

Q. In what respect does the identification of persons by finger prints supersede the Bertillon system of identification?

A. It supersedes the Bertillon system by reason of its inexpensiveness and simplicity compared with the costly implements for measuring and the expert knowledge called for by the anthropometric system and because of its reliability in making positive identifications at any time during the natural life of a person and for some time after death, while the Bertillon system cannot be relied upon until after maturity, and even then its evidence is only partial and not positive; it is superior also in the difference in time consumed when making a search of the files, this being less than five minutes under the finger print system while under the Bertillon system it very often requires an hour or more, owing to the variation of measurements; especially when the original measurements on file were taken prior to maturity.

Q. What are outlets or ducts?

A. They are the mouths of the sweat glands.

Q. What duty do these outlets or ducts perform?

A. They serve to carry off the moisture of the body in the form of perspiration; they also emit nature's oil, by which the skin is kept soft and pliable.

Q. Where do these outlets or ducts make their appearance in ridge formations?

A. On the top or summit of the ridges.

Q. What is the appearance of these outlets or ducts in finger impressions?

A. They appear as small white spots through the center of the ridges.

Q. Why do the ducts appear as white spots in finger impressions?

A. This appearance is caused by reason of the ducts being depressed and not coming in contact with the ink when taking impressions; the same as in the case of depressions.

Q. How many kinds of ridge destruction are there in finger impressions?

A. There are two kinds.

Q. Name them?

A. Temporary and permanent ridge destruction.

Q. Name some of the causes of temporary ridge destruction?

A. Skin diseases, the handling of lime, plaster or cement, having the hands continually wet (such as with dishwashers, bottlers, etc.), the continual handling of rough or hard sharp objects (such as with bricklayers, masons, drivers, etc.), warts, and creases or folds in the skin.

Q. Name some causes for permanent ridge destruction?

A. Cuts, burns, scars from any cause, ulcers, etc.; in fact, any injury that would destroy the sweat glands.

Q. What effect has ordinary manual labor upon the ridges?

A. It tends to increase and strengthen the ridge formation, making the ridges thicker and heavier.

Q. What classes of employment are an exception to this?

A. Cement workers, plasterers, dishwashers; having the hands continually wet; handling rough or hard sharp objects, such as bricklayers, masons, truck drivers, etc., are compelled to do.

Q. What effect would a skin disease have upon the ridges?

A. It would cause a temporary destruction until such time as the disease is cured, when the ridges would assume their natural or normal condition.

Q. What effect would an ulcer have upon the ridges?

A. An ulcer being a sore that works deeply into the flesh would, if the sweat glands were destroyed, permanently destroy the ridges and leave a scar.

Q. What effect would a burn have upon the ridges?

A. If the burn was severe enough to injure the sweat glands it would cause a permanent destruction of the ridges and leave a scar.

Q. What effect would a cut have upon the ridges?

A. It would leave a scar, having the appearance of a thin white line in impressions, and would cause the ridges to pucker slightly on both sides of the scar.

Q. What effect do creases have upon the ridges?

A. They have no effect, simply appearing as a white line crossing the ridges.

Q. In what way do cuts differ from creases in impressions?

A. They both appear as white lines, but a cut leaves a permanent scar with the ridges puckered, while a crease is only temporary and does not show this puckering of the ridges, simply having the same effect as the depressions.

Q. What effect do warts have upon the ridges?

A. Warts do not destroy the ridges; they cause only a temporary disarrangement of same until removed, when the ridges resume their normal position and condition.

Q. How would a wart in an impression appear?

A. It would appear as a light spot, encircled by a black ring.

Q. What causes this black ring around a wart in impressions?

A. The wart in making its appearance on the surface of the skin presses the ridges to the sides, causing a crowding of the ridges around the wart, thereby giving it the appearance of a broad or heavy ridge.

Q. Would you consider a wart as a good characteristic in comparing impressions, and why?

A. A wart is not considered as a good characteristic point because it is not a permanent ridge destruction, but if it appeared in both impressions it could be considered in connection with other ridge characteristics.

Q. What reliance would you place in a scar, when making comparisons or a search of the files?

A. A scar cannot be relied upon owing to the fact that it may be the result of an injury received since the taking of the original prints, but if it appeared in both sets of prints it would be considered as a very good characteristic point.

Q. Why are creases in impressions not considered as reliable characteristic points?

A. Because they are caused by the folding of the skin and are only temporary.

Q. What branches of government (city, state and federal) use the finger print system, and how is it used?

A. **City.** The Police Department, for the identification of persons who have a previous criminal record, for the apprehension and identification of criminals who have left telltale impressions while committing a crime, and for establishing the identity of unknown dead.

The Magistrates' Courts, for the identification of habitual prostitutes, drunkards, vagrants, pickpockets, mashers, etc., and to aid the magistrates in imposing sentence.

The Departments of Correction, for the identification of habitual offenders who are sentenced to the workhouse.

The Municipal Civil Service Commission, City of New York, in examinations for positions under the Municipal Government, to prevent impersonation.

State. State Prison Department, for the identification of persons who are committed to the various penal institutions, and for the apprehension of such prisoners in the event of an escape.

Federal. The War and Navy Departments, to prevent the enlisting of persons who were dishonorably discharged, or those with criminal records; for the apprehension and identification of deserters; and for the prevention of unknown dead on the battlefield in case of war.

In Federal Prisons, they are used for the same purposes as in the State Prisons.

Q. Name a few additional branches (both mercantile and governmental) in which finger impressions are not used at present but could be utilized with success, and how?

A. By Banking Institutions, to prevent the withdrawal of funds by unauthorized persons and for the protection of persons who are unable to read or write.

By Individuals, in connection with their signature, as a safeguard for the prevention of forgery.

By Corporations, to prevent the employment of undesirable persons, or re-employment of persons who were discharged by them for some cause.

By Life Insurance Companies, to prevent impersonation in medical examinations, or the filing of a false claim in case of death.

By the Immigration Bureau, to prevent the admission of undesirable aliens or the re-entering of persons who were deported.

By the Bureau of Elections, to prevent false registration and illegal voting at elections.

In fact a finger impression when placed on any official docu-

ment would be a positive safeguard against forgery and would prevent fraudulent transactions.

Q. Into how many types are all finger impressions divisible?

A. Four types.

Q. What are these types?

A. Loops, arches (including tented arches), whorls and composites (which include lateral pocket loops, twinned loops, central pocket loops and accidentals).

Q. How many classes or groups of impressions are there under the finger print system?

A. Two groups.

Q. Name them?

A. Loops and arches under one class, and whorls and composites under the other.

Q. Why are loops and arches placed under one class and whorls and composites under the other?

A. Because loops and arches are those patterns having no numerical value of their own, while whorls and composites have a numerical value in accordance with their position, or the pair in which they appear in a set of finger impressions.

Q. Which have numerical values in primary classification, whorls or loops?

A. Whorls.

Q. How many kinds of loops are there? Name them?

A. There are two kinds; radial and ulnar.

Q. From what do the radial and ulnar loops derive their name?

A. They derive their name from the fact that the slant of the ridges is either toward the radius or ulnar bone of the forearm; hence the names radial and ulnar.

Q. What is a loop?

A. A loop is a pattern in which one or more ridges enter on either side of the impression and, by making a recurve, pass out or terminate on the same side as the ridge or ridges entered.

Q. What is an ulnar loop?

A. An ulnar loop is one in which the downward slant of the ridge or ridges is from the thumb toward the little finger or ulnar bone.

Q. What is a radial loop?

A. A radial loop is one in which the downward slant of the ridge or ridges is from the little finger toward the thumb or radius bone.

Q. How would an ulnar loop in the right hand appear if transposed or impressed in the space allotted to the left hand, and give reasons for answer?

A. It would appear in the left hand as a radial loop, for the reason that the transposition would cause the ridges to slant in the direction of the thumb.

Q. How many deltas appear in plain loops?

A. One.

Q. Name the types of patterns having more than one delta?

A. Whorls and composites.

Q. What type of pattern has no delta?

A. Arches.

Q. What is an arch?

A. An arch is a pattern in which the ridges flow from one side to the other, without recurving, usually having a slight upward curve in the center, giving the appearance of an arch.

Q. What is a tented arch?

A. A tented arch is a pattern in which the ridges flow from one side to the other without recurving, but differ from plain arches, as the ridges rise higher in the center, giving the pattern the appearance of a tent.

Q. What is a whorl?

A. A whorl is a pattern in which the ridges form a series of circles or spirals around the core or axis.

Q. Are whorls single or double cored?

A. Both single and double.

Q. What is a composite?

A. A composite is a pattern in which any two or more patterns appear together.

Q. How are composites subdivided?

A. Into lateral pocket loops, twinned loops, central pocket loops and accidentals.

Q. What are central pocket loops?

A. Central pocket loops are those patterns in which most of the ridges represent the pattern known as a loop, but where one or more of the ridges within such loop or those surrounding the core recurve somewhat like a spiral, so as to be at right angles to a line drawn through its axis, thereby forming the second delta.

Q. What is a lateral pocket loop?

A. It is a pattern in which the ridges have the appearance of being two loops, one surrounding or overlapping the other, but in which the ridges about the cores have their termination on the same side of the delta.

Q. What is a twinned loop?

A. It is a pattern consisting of two distinct loops, one surrounding or overlapping the other and having the termination or outlet of the ridges immediately around the core of each loop, separated by or on opposite sides of either delta.

Q. How do twinned loops and lateral pocket loops differ?

A. They differ because the terminations of the ridges immediately around the cores in twinned loops are separated by a delta, while in lateral pocket loops they terminate on the same side and are not separated by a delta.

Q. What are accidentals?

A. They are patterns in which two or more of the different types of patterns are represented.

Q. Into what percentages are the various types of patterns divided?

A. Loops, 60 per cent. Whorls, including composites, 35 per cent. Arches, including tented arches, 5 per cent.

Q. Enumerate the various articles required for taking and classifying finger impressions?

A. A table, a slab (either metal or glass), a roller, printer's black ink, finger print blanks, a pointer, magnifying glass, and benzine.

Q. What kind of ink is used in taking finger prints?

A. Printer's black ink.

Q. How are the rolled impressions of the right hand taken?

A. By placing the fingers on the slab individually, so that the right side of the nail is at right angles with the slab, rolling the finger toward the left, until the left side of the nail is at right angles with the slab; the finger now being properly inked, the same process is used in placing it on the finger print blank.

Q. In taking the rolled impressions why is the finger rolled toward the body?

A. Because toward the body is the natural way, while from the body it is awkward and unnatural.

Q. What are rolled impressions?

A. An impression of the entire ridge surface of the outer joint of the finger from one side of the nail to the other.

Q. Why are rolled impressions taken?

A. They are taken so that the impression can be properly classified by having the entire ridge surface represented, and incidentally they give a larger number of characteristic points for comparison.

Q. Name the order in which rolled impressions are taken?

A. Right thumb, index, middle, ring and little fingers; left thumb, index, middle, ring and little fingers.

Q. What are plain impressions?

A. Impressions that are made by simply placing the inked finger on the blank form without rolling it.

Q. In what respect do plain impressions differ from rolled impressions?

A. In plain impressions only a portion of the pattern is shown, while in rolled impressions the entire pattern is visible.

Q. For what important purpose are the plain or simultaneous impressions taken?

A. As a check upon the position of the rolled impressions, to prevent errors in classifying in the event of a misplaced rolled impression, as an aid in determining the type of pattern when rolled impressions are blurred or indistinct, and for making comparisons with impressions left at the scene of a crime.

Q. On what side of the subject do you take your position when taking impressions of the right hand; also the left hand?

A. In taking the right hand the position is to the left of the subject, and for the left hand, to the right of the subject.

Q. In inking a slab, what precautions must be taken?

A. See that the slab and roller are perfectly clean and free from dust; and that the ink has been well distributed, so that only a thin film of ink is spread on that portion of the slab where the fingers are rolled or impressed; in this way imperfect impressions are prevented.

Q. What is meant by classifying an impression?

A. The marking of an impression in accordance with the patterns therein represented, taking into consideration their position in the print, and by ridge tracing or ridge counting, the result thereof being the classification of the impression.

Q. What are the fixed points in impressions?

A. Core or inner terminus and delta or outer terminus.

Q. What purpose do the core and delta serve in loops?

A. They serve as fixed points in ridge counting, to determine the number of ridges intervening between said core and delta.

Q. What purpose do the core and delta serve in whorls?

A. The core simply serves as a characteristic point for comparison, while the delta serves as a fixed point in ridge tracing, to determine whether it is an inner, meet or outer whorl.

Q. How would you find whether a whorl is an inner, meeting or outer?

A. By tracing the ridge emanating from the left delta, toward the right, dropping to the ridge below in the event that such ridge terminates, or by proceeding on the lower branch in case of a bifurcation of such ridge; if the ridge so traced passes on the inside of the right delta, with three (3) or more ridges intervening, it is termed as an inner; if not more than two (2) ridges intervene, when passing on the inside or outside of right delta, it is termed a meet; if it passes on the outside of right delta, with three (3) or more ridges intervening, it is termed an outer.

Q. How do you find whether a loop is inner or outer?

A. By counting the ridges intervening between the delta and the core; in the index fingers nine (9) or less ridges intervening is an inner and ten (10) or more is an outer, while in the middle fingers, ten (10) or less is an inner and eleven (11) or more an outer.

Q. Which patterns have cores?

A. Loops, whorls and composites.

Q. In loops, how would you determine the core?

A. If the inner ridge is a single loop, the ridge of said loop farthest from the delta, at a point near the top, just before recurving, is taken as the core; if a single ridge appears in the center of the loop, the top of said ridge is considered the core; if two (2) ridges appear in the center, the top of the ridge farthest from the delta is the core; if an even number of ridges appear, the two (2) center ridges are singled out and treated the same as when two ridges appear; if an uneven number of ridges appear, the center ridge is considered as the core, the same as for one ridge.

Q. How many deltas appear in whorls? In composites?

A. Two. Two or more.

Q. Are loops single or double cored?

A. Single cored.

Q. In what respect do single cored whorls differ from double cored whorls?

A. Single cored whorls are those patterns formed by a series of circular ridges or by a single spiral, while double cored are the double spiral patterns.

Q. How is the delta or outer terminus formed?

A. It may be formed by the bifurcation of a ridge, giving the appearance of a Y; or by a ridge line abruptly deviating in its course; or by two short ridge lines forming the letter V; or by a dot or a short ridge line between two ridges running parallel and then separating, one running up and the other down.

Q. When is ridge counting resorted to?

A. When a loop appears in the index or middle fingers of either hand in combination with whorls in the other index or index and middle fingers, to determine whether they are inner or outer loops, for the secondary or sub-classification; also for the second sub-classification when loops appear in both index fingers, or index and middle fingers of both hands, provided no arches, tented arches or radial loops appear before or after the index fingers; and to determine the final classification, when a loop appears in the right little finger.

Q. What points are excluded in ridge counting?

A. The core or inner terminus and the delta or outer terminus.

Q. When is ridge tracing resorted to?

A. When whorls or patterns of the composite type appear in either or both index fingers, or in the index and middle fingers of either or both hands; the result of such tracing being expressed as either I, M or O in the secondary or sub-classification of impressions.

Q. Why is the sub-classification used?

A. To sub-divide impressions having the same primary classification.

Q. When is a loop in the index finger marked I and when O?

A. It is marked I when nine or less ridges intervene between the core and delta, and O when ten or more ridges intervene.

Q. When is a loop in the middle finger marked I, and when O?

A. It is marked I when ten or less ridges intervene between the core and delta, and O when eleven or more ridges intervene.

Q. In what instances would you consider the ten fingers for the sub-classification?

A. In impressions where the index fingers are represented by an A, T, R, or U, and the remaining eight fingers are represented by either an *a*, *t*, or *r*.

Q. What signs or symbols are used in marking the patterns found in the ten digits?

A. \ for ulnar loops in the right hand and radials in the left; / for ulnar loops in the left hand and radial in the right; A for arches, T for tented arches when appearing in the index fingers; *a* for arches, *t* for tented arches when appearing in fingers other than the index; *w* for whorls and composites. For composites, the letters L.P. for lateral pocket loops, C.P. for central pocket loops, T.L. for twinned loops, and Ac for accidentals, could be used in addition to the *w*, to denote the kind of composite therein represented, although in actual practice they are not so used. I, M, and O are also used for whorls, and I and O for loops, when appearing in the index or index and middle fingers.

Q. Name the signs or symbols not used in the classifying of an impression?

A. L, for loop; C, for composite; I.T., for inner terminus; and O.T., for outer terminus.

Q. What is meant by the primary classification of a print?

A. The primary classification of a print is represented by numerals in the form of a fraction, and determines the file under which the impression is filed.

Q. How is the primary classification obtained?

A. By the addition of the numerical value assigned to whorls appearing in an impression, to the result of which the value of one (1) is added to both numerator and denominator; in impressions having no whorls, one (1) is used for both numerator and denominator for the primary classification.

Q. Why is one (1) added to both numerator and denominator for impressions having one or more whorls represented therein?

A. To account for the value of one (1) used for impressions having no whorls.

Q. Why is one (1) used for both numerator and denominator, in impressions having no whorls?

A. So as to provide a compartment in the file, under the numerical valuation.

Q. What numerical values are assigned to whorls and composites in impressions?

A. When appearing in the first pair (right thumb and right index finger), the value of 16; in the second pair (right middle and ring fingers), the value of 8; in the third pair (right little finger and left thumb), the value of 4; in the fourth pair (left index and middle fingers), the value of 2; and the fifth pair (left ring and little fingers), the value of 1.

Q. Why is the primary classification inverted?

A. So as to place an impression under the primary classification in the same compartment as those already filed under the key system, used prior to the adoption of the numerical values.

Q. What is the secondary or sub-classification of an impression?

A. It is the second portion of the classification of an impression; it follows the first or primary classification, and is used to sub-divide the primary classification.

Q. Why is an allowance made of two ridges inside and two ridges outside of the right delta for meet whorls?

A. To more evenly distribute the collection of whorls into inners, meets and outers, for the reason that there are very few whorls in which the ridge emanating from the left delta exactly meets the right delta.

Q. How is the secondary classification of an impression expressed and what fingers does it represent?

A. By the capital letters A, T, R and U for arches, tented arches, radial and ulnar loops, when appearing in the index fingers; also with small letters *a*, *t*, or *r*, when appearing in fingers either before or after either of the above; it is also represented by I, M or O, when whorls appear in the index fingers; by II, IM, IO, etc., for whorls in index and middle fingers of the same hand; by I or O, when loops appear in index finger of one hand with whorl in the other; and by II, IO, etc., when loops appear in index and middle fingers of one hand with whorls in index finger or index and middle fingers of the other hand. In the secondary classification the numerator represents the right hand and the denominator the left.

Q. How are arches, tented arches and radial loops represented in the classification of impressions having a whorl in both index fingers?

A. They are not represented in the classification of such impressions, as *a*, *t*, or *r* is never expressed either before or after the capitals I, M, or O.

Q. How are arches or tented arches represented in the classification, when appearing in one of the index fingers, with a whorl in the other?

A. They are represented by the capital A or T, the whorl being represented by I, M or O.

Q. Are the capital letters R and U used in combination with the capitals I, M or O, and why?

A. R and U are not used in connection with I, M, or O, owing to the fact that loops are represented in such cases by either I or O, the result of ridge counting.

Q. When whorls appear in either index finger, how are they classified?

A. They are given the numerical value of 16 for the numerator of the primary classification when appearing in the right index, and the value of 2 for the denominator when appearing in the left; for the secondary classification they are traced and expressed as either I, M, or O.

Q. How many combinations are there in the sub-classification of impressions having a loop in one index finger, with a whorl in the other, the index fingers only being considered?

A. Six. (See page 51.)

Q. How many primary classifications are found in finger print work?

A. 1024 primary classifications. (The result of 32 times 32.)

Q. How do the primary classification numbers run?

A. From 1 over 1 to 32 over 32.

Q. What is meant by the final classification of an impression?

A. It is the numeral representing the number of ridges intervening between the core and delta in the loop appearing in the right little finger.

Q. How are missing or deformed fingers (digits) classified?

A. When fingers are missing, or so deformed as to make it impossible to take an impression or properly classify them, they are given the same classification as the corresponding fingers of the other hand; if they are fingers where ridge tracing or ridge counting is resorted to for the secondary, second sub, or final classification, they would be governed by the result of such ridge tracing or counting of the other hand.

Q. How are impressions classified, when the same finger of both hands is missing?

A. They are classified as whorls, and if they were the fingers where ridge tracing was resorted to for the secondary classification, they would be considered as meet (M) whorls.

Q. What are characteristics in finger impressions?

A. They are peculiarities of the ridges, such as abrupt endings, bifurcations, the formation of what is termed an island, short ridge lines, ridge dots, some peculiarity as to the formation of the delta or core; in fact, any peculiarity out of the ordinary may be considered a characteristic point.

Q. What is the value of ridge characteristics in finger print work?

A. They serve as a positive means of identification.

Q. To what extent are these characteristics used?

A. They are used when making a search of the files, by comparing them with the impressions having the same classification; they are also used in the prosecution of criminal cases, where impressions are left in the commission of a crime. In such cases the impressions are enlarged and the characteristic points of both impressions are diagramed to correspond with each other.

Q. How would you trace the ridges of a pattern having more than two deltas, to determine whether it was inner, meet, or outer?

A. I would start to trace from the delta on the extreme left toward the delta on the extreme right, the same as for whorls or patterns with two deltas, giving no consideration to the delta or deltas which might appear between these two points.

Q. How many secondary classifications are under the primary classification 32 over 32?

A. Eighty-one secondary classifications.

Q. Name the secondary classifications under the primary classification 32 over 32?

A. See page 53.

Q. Name the second sub-classifications under the primary and secondary classification 1 over 1, U over U, the small lettered group not being considered?

A. See page 54.

Q. What is done when a loop or whorl is found in the right little finger?

A. When a loop appears in the right little finger, ridge counting is resorted to for the final classification; when a whorl appears it is given the value of four (4) for the denominator of the primary classification.

Q. Do arches have deltas?

A. In true arches there are no deltas, but if the appearance of a delta should present itself, there must be no recurving ridge passing between the core and such delta so as to make ridge counting possible.

Q. What do the capital letters, A, T, R and U, indicate in the secondary classification?

A. They represent the pattern appearing in either or both index fingers, as A for arch, T for tented arch, R for radial loop, and U for ulnar loop.

Q. Why does the ink fail to adhere to the fingers of some persons, and what would you do to obtain good impressions of such persons?

A. This is caused by the reason that some persons' hands perspire very freely, thereby preventing the ink from being taken up by the ridges; when the fingers are dried with a piece of cheese-cloth this difficulty is removed and good impressions are obtainable.

Q. Why is the impression of the right index finger taken immediately after the signature of the prisoner?

A. It is taken as a check upon the impressions on the reverse side of the blank, thus proving that the impressions are those of the person who signed the said form.

Q. How many combinations are possible in the sub-classification of impressions having a whorl in the index finger of one hand, with a loop in the index and middle fingers of the other, the middle finger of the other hand not being considered?

A. Twelve. (See page 52.)

Q. How many combinations in the sub-classification result from impressions having a whorl in the index and middle fingers of one hand with a loop in the index of the other hand, not considering the middle finger?

A. Eighteen. (See page 52.)

Q. Impressions having a whorl in both index fingers and one of the middle fingers (the other not being considered), would give how many combinations in the sub-classification?

A. Twenty-seven. (See page 52.)

Q. How many combinations are possible in the sub-classification of impressions having a whorl in the index and middle fingers of one hand, with loops in the corresponding fingers of the other hand?

A. Thirty-six. (See pages 52 and 53.)

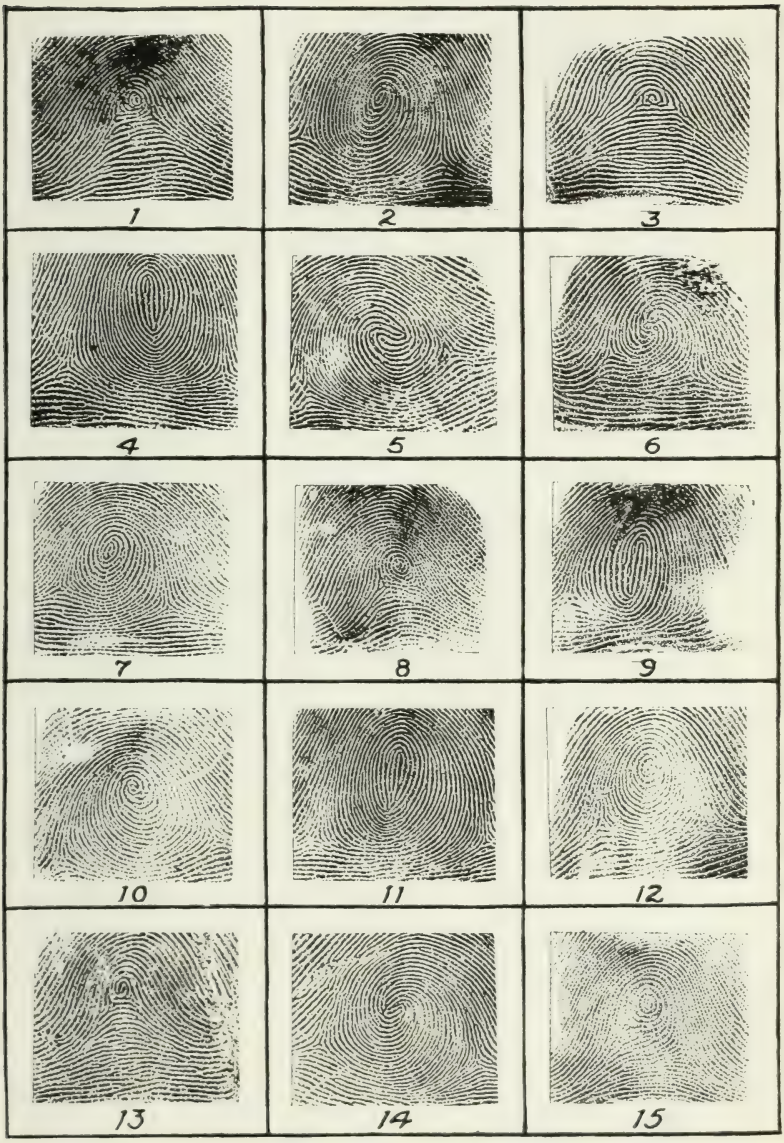
Q. Upon what two peculiarities of the ridges is the finger print system based?

A. First, upon their formation into various patterns, which are divided into two groups, one with a numerical value and the other without.

Second, upon the formation of two fixed points, known as core and delta, together with the ridges intervening and surrounding these two points.

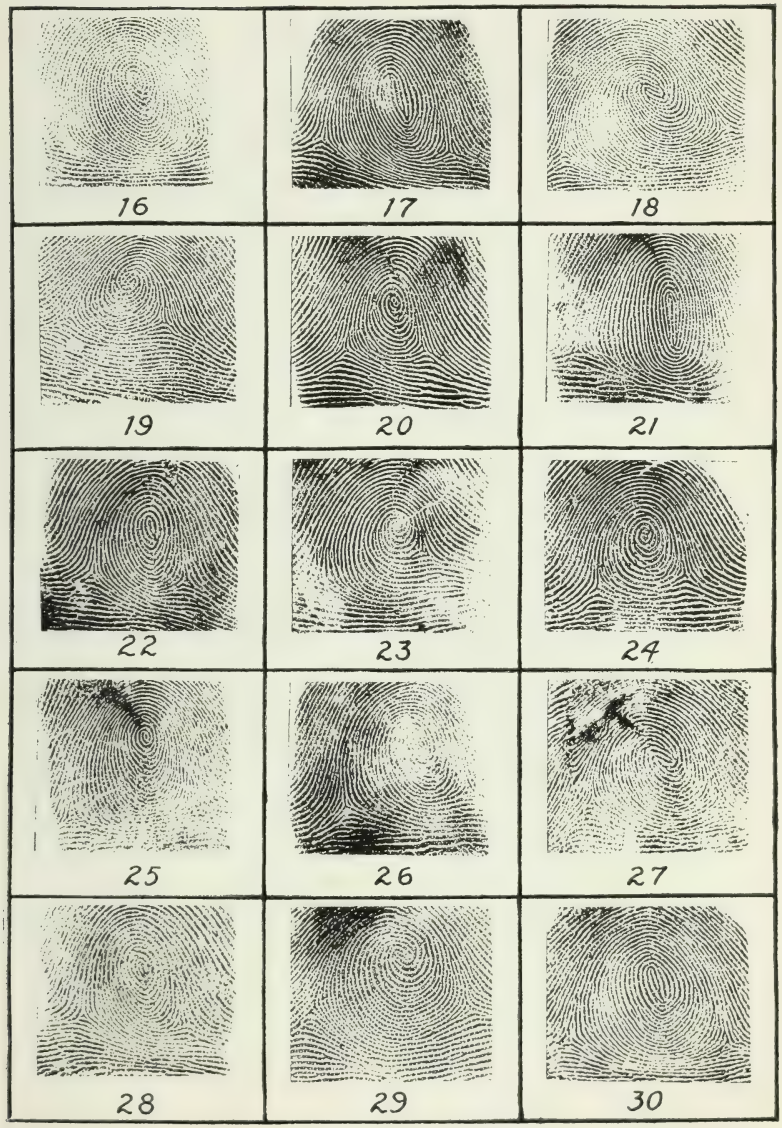
By these two peculiarities, the primary classification, the secondary classification, and for some impressions the final classification, are determined.

ILLUSTRATIONS



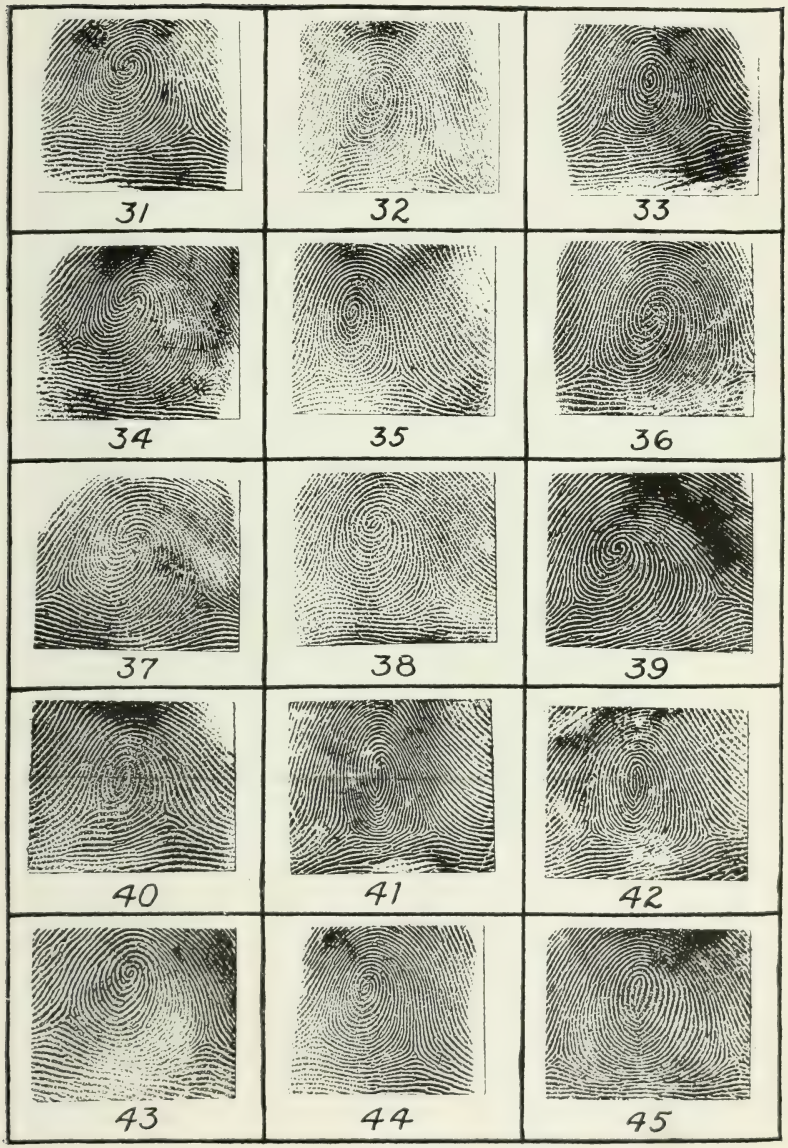
VARIOUS TYPES OF WHORLS

ILLUSTRATIONS



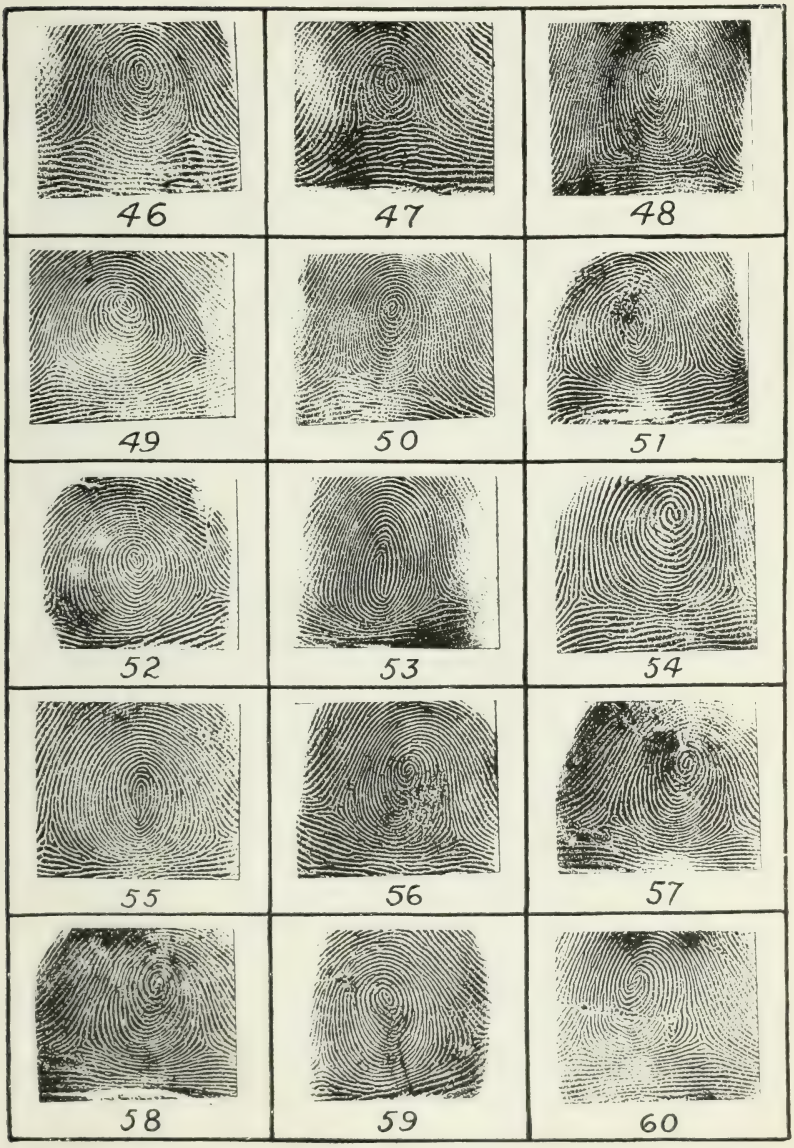
WHORLS (OUTER)

ILLUSTRATIONS



WHORLS (INNER)

ILLUSTRATIONS



WHORLS (MEET)

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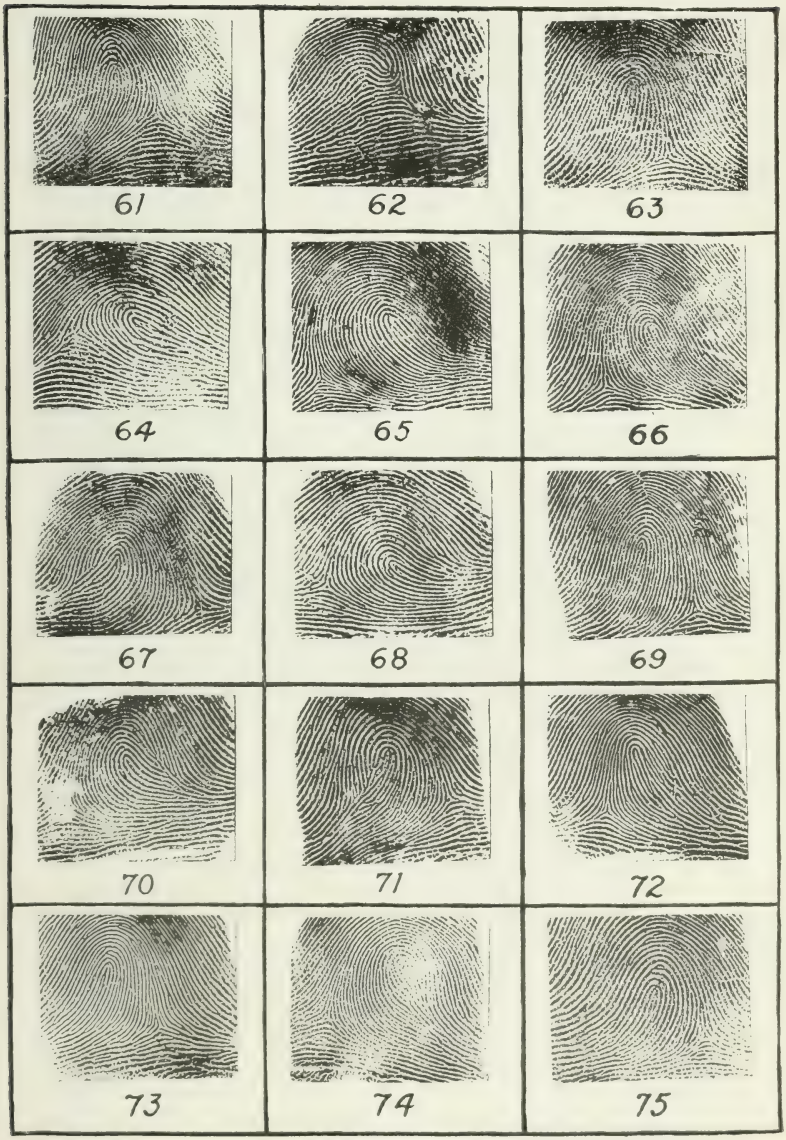
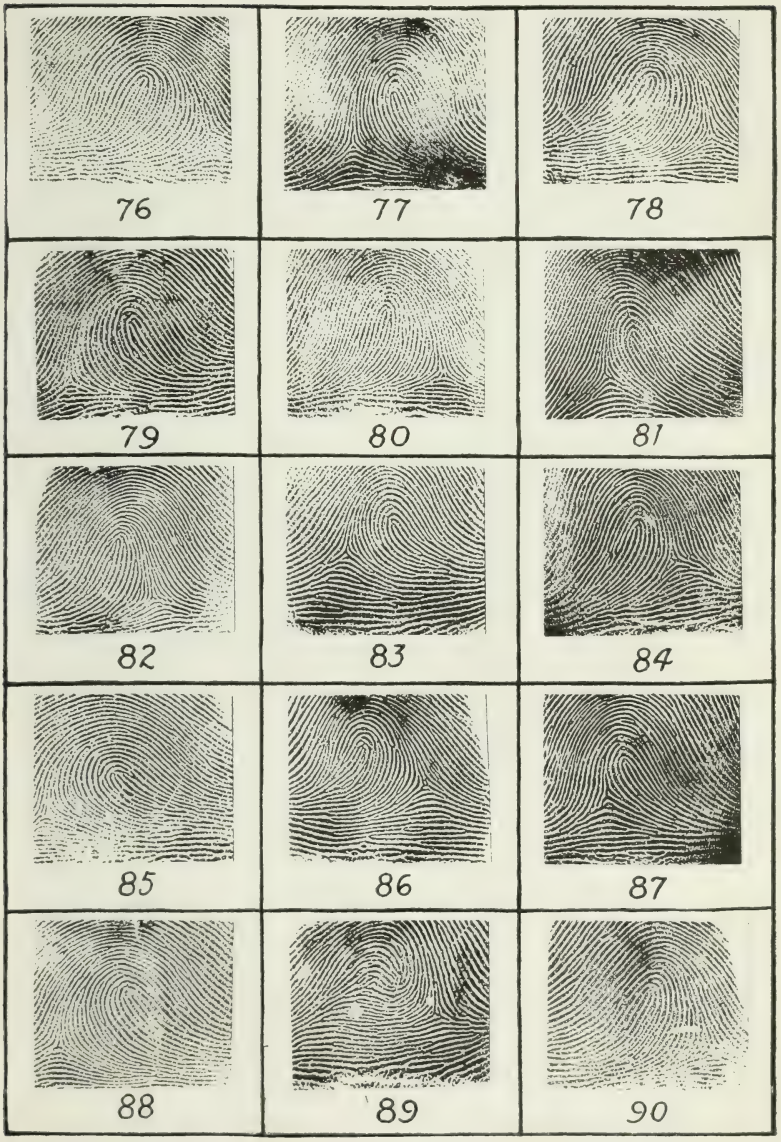


LOOPS

ILLUSTRATIONS



Loops

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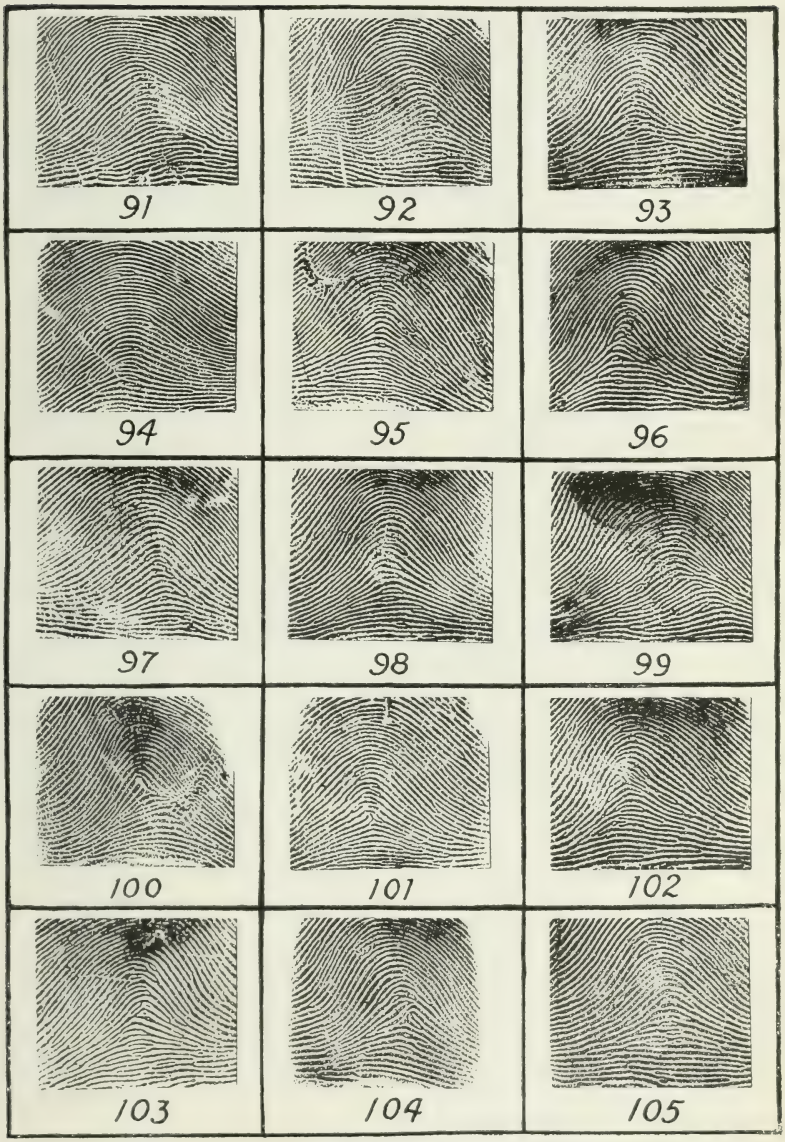
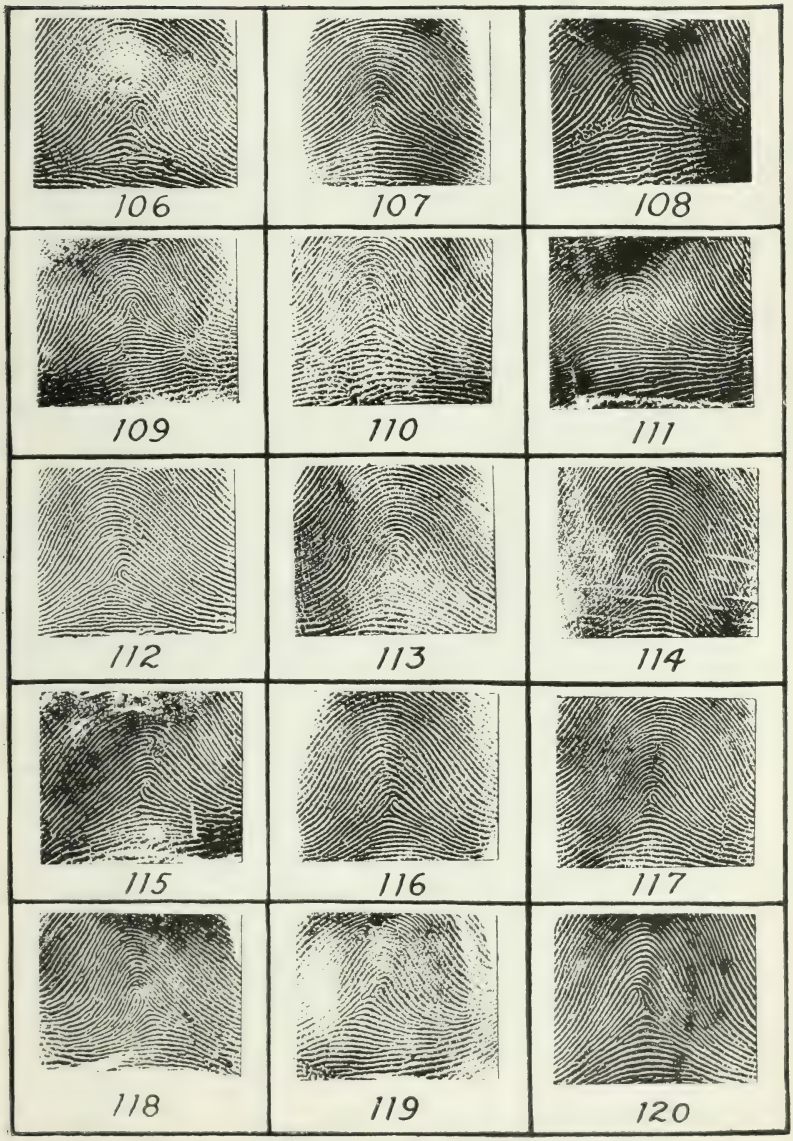


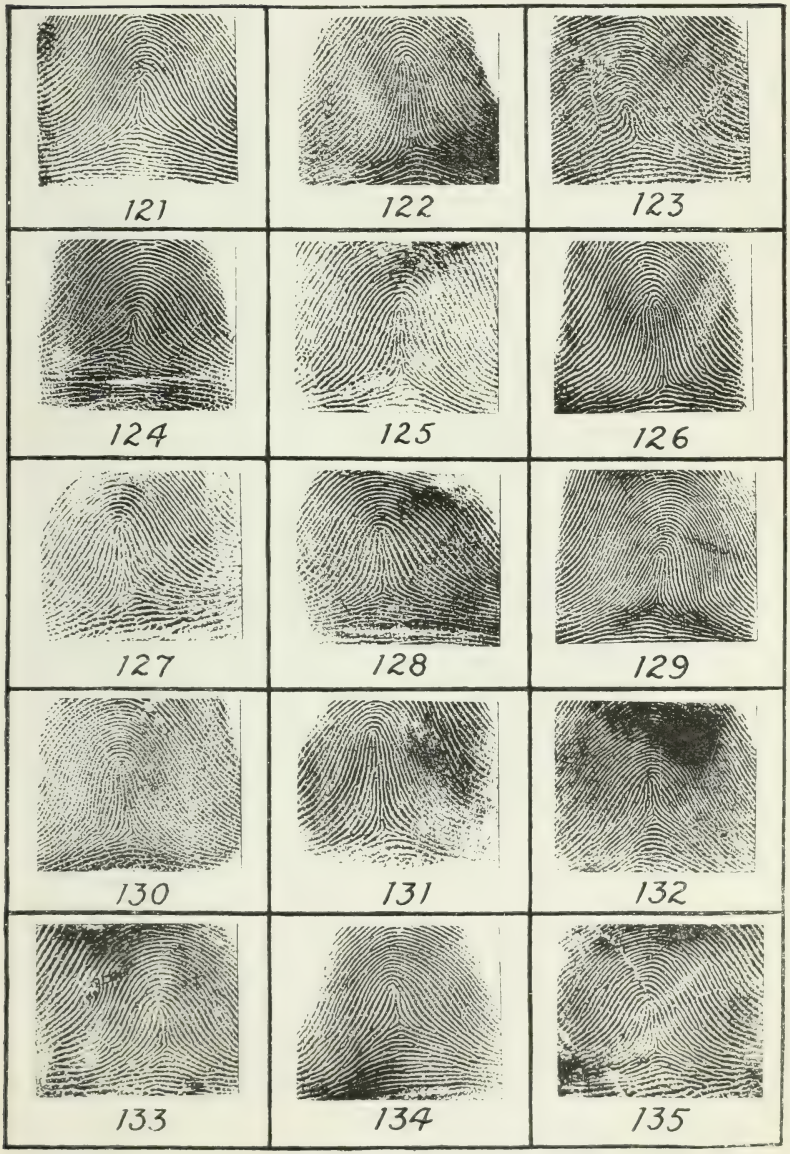
ARCHES

ILLUSTRATIONS



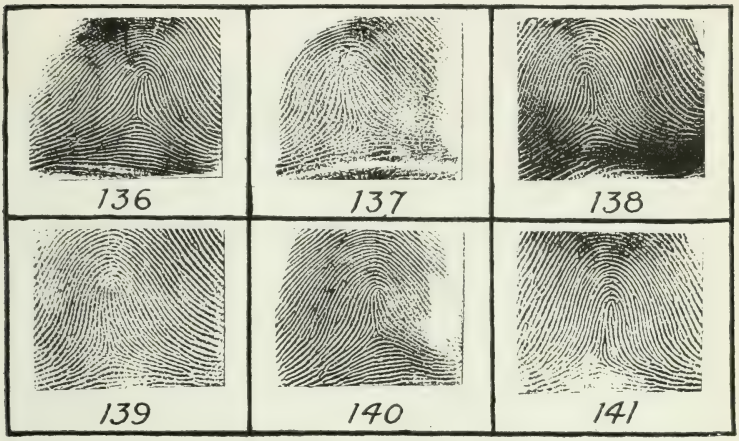
Loops Closely Resembling Arches

ILLUSTRATIONS



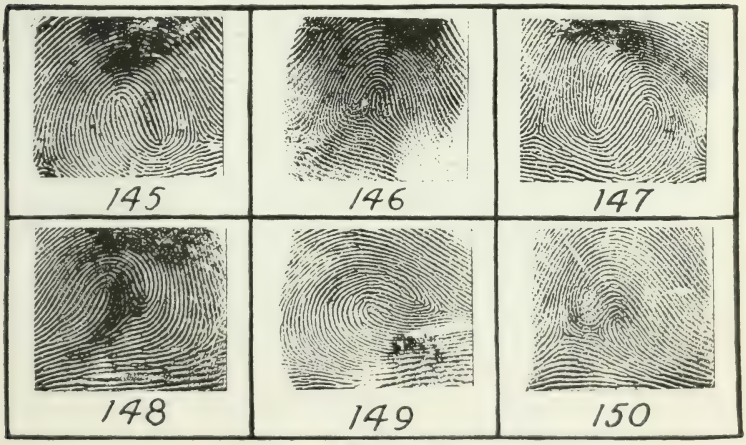
TENTED ARCHES

ILLUSTRATIONS



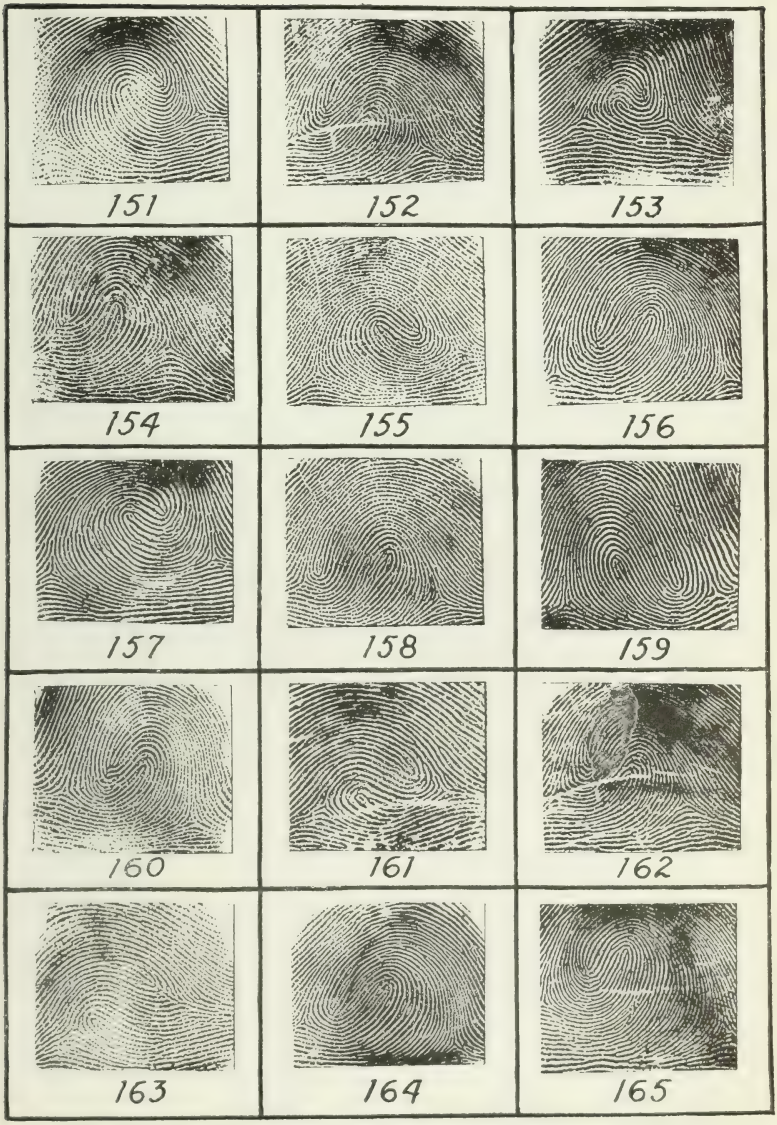
Loops Closely Resembling Tented Arches

Loops Closely Resembling Lateral Pocket Loop



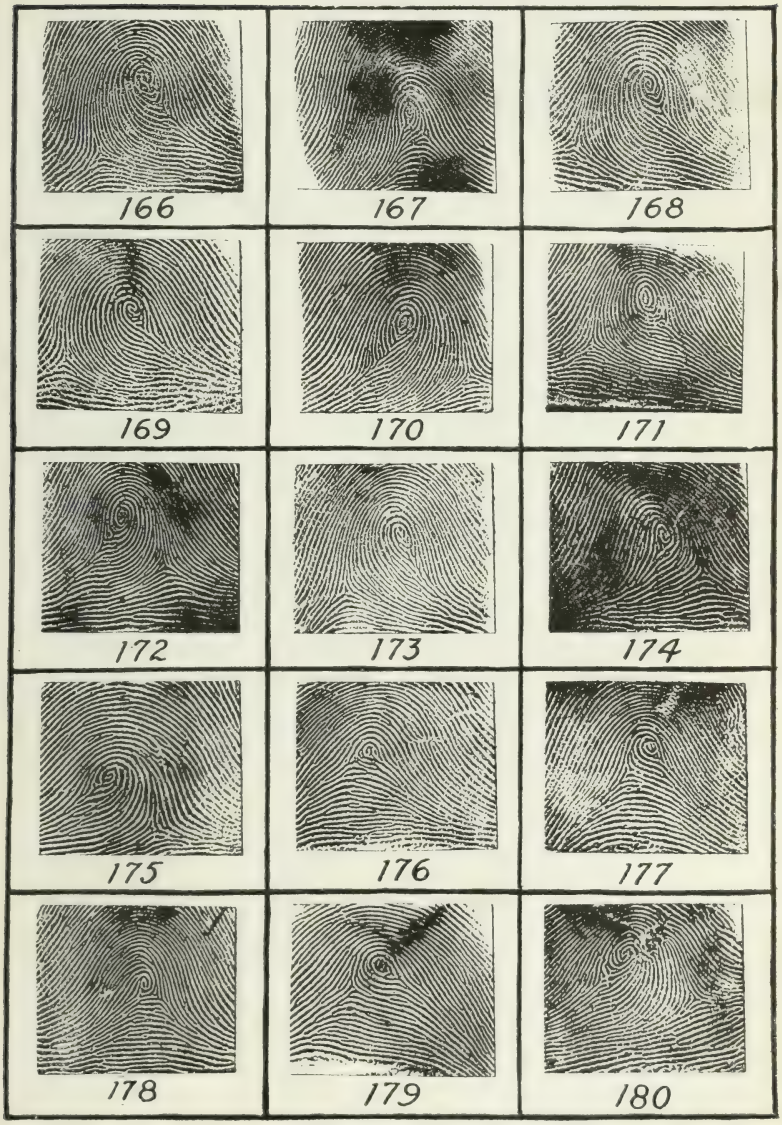
Lateral Pocket Loops

ILLUSTRATIONS



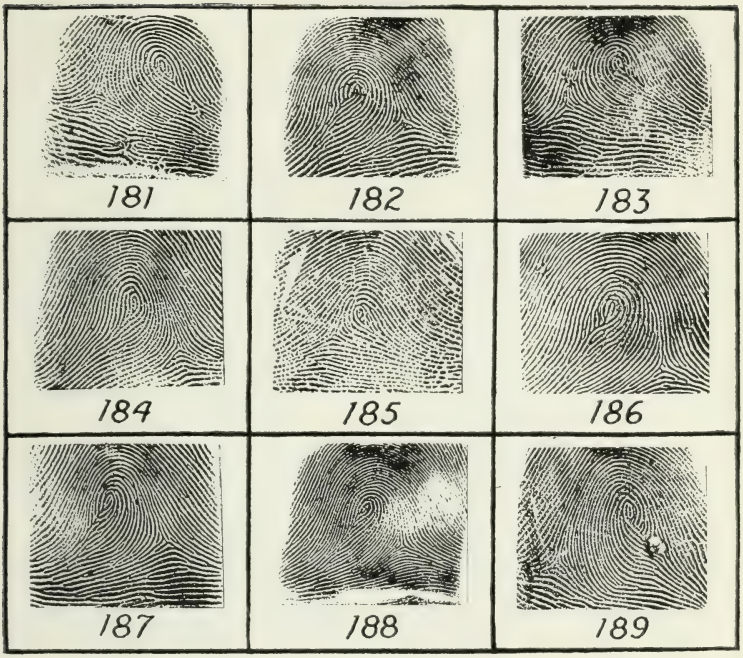
TWINNED LOOPS

ILLUSTRATIONS

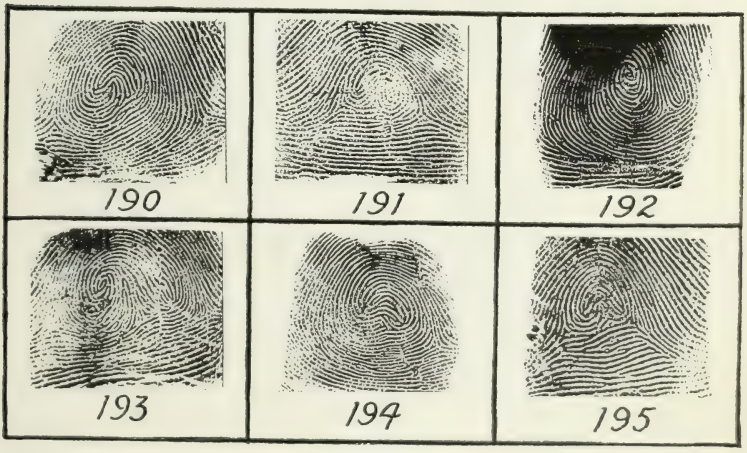


CENTRAL POCKET LOOPS

ILLUSTRATIONS



Loops Closely Resembling Central Pocket Loops



Accidentals

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Plate No. 6

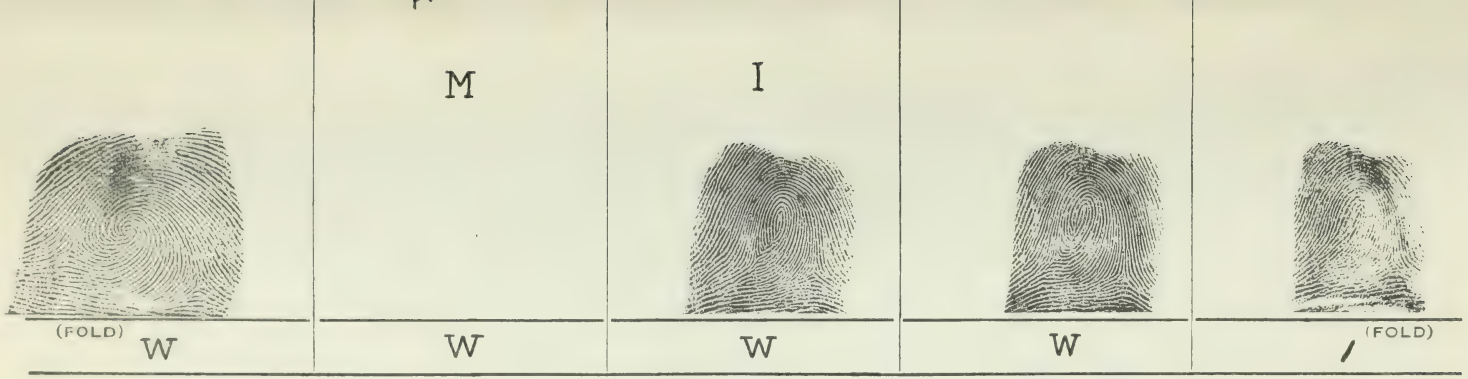
Classification $\frac{31}{12}$ $\frac{M\,O}{M\,I}$ 13 Amp.

RIGHT HAND

1—Right Thumb	2—R. Forefinger	3—R. Middle Finger	4—R. Ring Finger	5—R. Little Finger
 (FOLD) \	AMP M W	O  W	 W	13  \ (FOLD)

LEFT HAND

6—Left Thumb	7—L. Forefinger	8—L. Middle Finger	9—L. Ring Finger	10—L. Little Finger



LEFT HAND

Plain impressions of the four fingers **taken simultaneously**

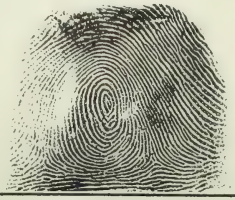
RIGHT HAND

Plain impressions of the four fingers **taken simultaneously**

Plate No. 5

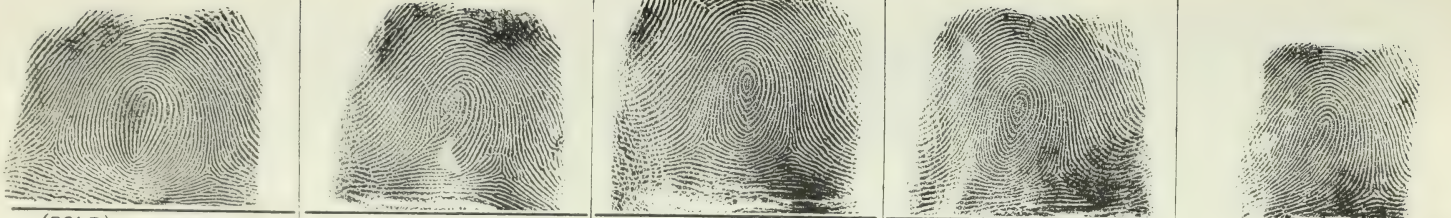
Classification $\frac{31}{6}$ $\frac{M}{O}$

RIGHT HAND

1—Right Thumb	2—R. Forefinger	3—R. Middle Finger	4—R. Ring Finger	5—R. Little Finger
	M 			
(FOLD) /	W	\	W	W (FOLD)

LEFT HAND

6—Left Thumb	7—L. Forefinger	8—L. Middle Finger	9—L. Ring Finger	10—L. Little Finger



LEFT HAND

Plain impressions of the four fingers **taken simultaneously**

RIGHT HAND

Plain impressions of the four fingers **taken simultaneously**

Plate No. 4

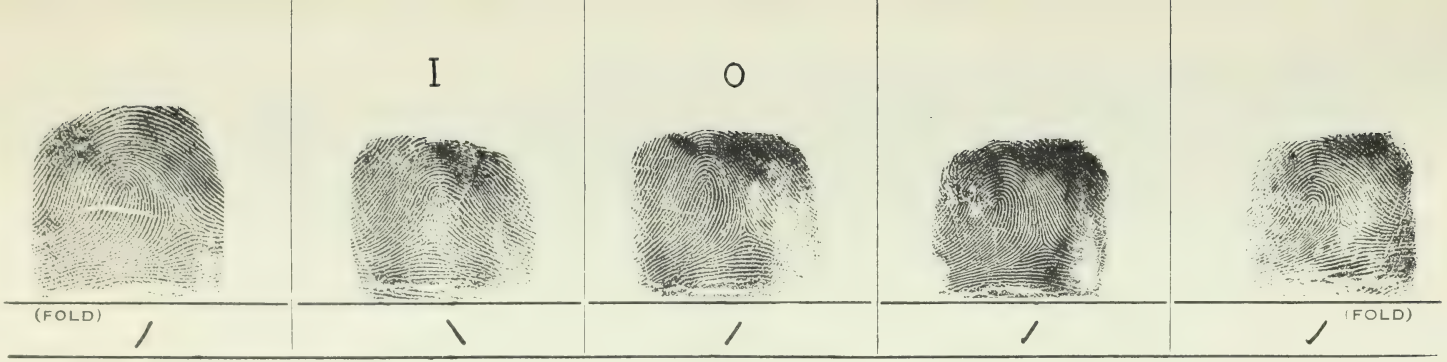
Classification $\frac{25}{5}$ $\frac{1}{10}$

RIGHT HAND

1—Right Thumb	2—R. Forefinger	3—R. Middle Finger	4—R. Ring Finger	5—R. Little Finger
				
(FOLD) a	W	\	W	W (FOLD)

LEFT HAND

6—Left Thumb	7—L. Forefinger	8—L. Middle Finger	9—L. Ring Finger	10—L. Little Finger



LEFT HAND

Plain impressions of the four fingers **taken simultaneously**

RIGHT HAND

Plain impressions of the four fingers **taken simultaneously**

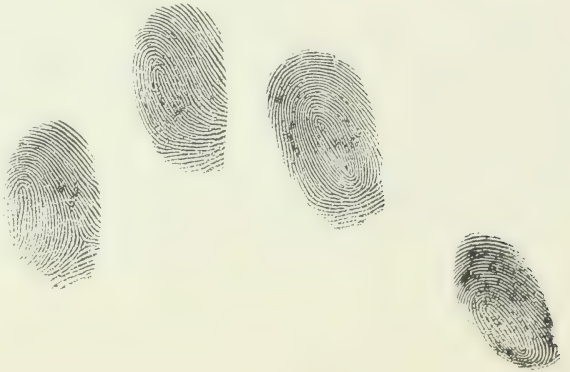


Plate No. 2

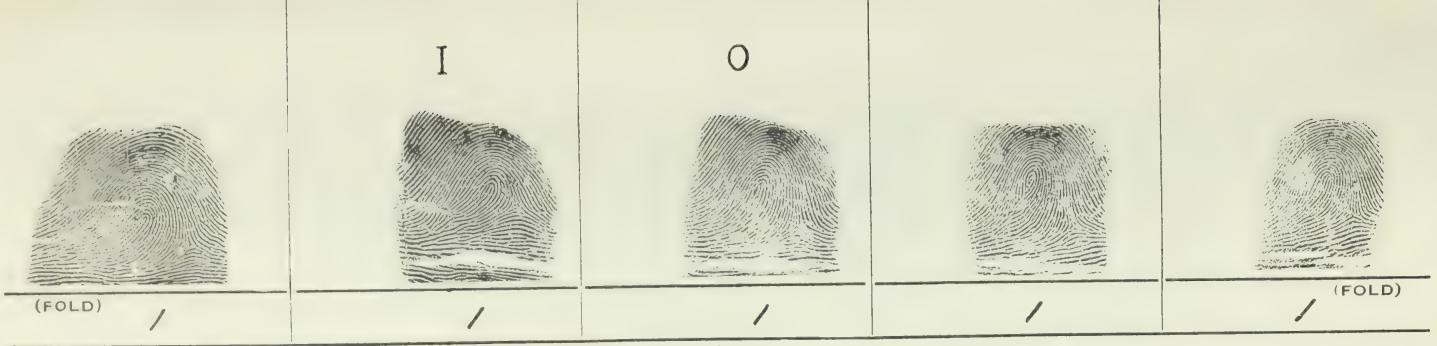
Classification $\frac{1}{1}$ $\frac{R}{U}$ $\frac{00}{10}$ 16

RIGHT HAND

1—Right Thumb	2—R. Forefinger	3—R. Middle Finger	4—R. Ring Finger	5—R. Little Finger
 (FOLD)				16  (FOLD)

LEFT HAND

6—Left Thumb	7—L. Forefinger	8—L. Middle Finger	9—L. Ring Finger	10—L. Little Finger



LEFT HAND

Plain impressions of the four fingers **taken simultaneously**

RIGHT HAND

Plain impressions of the four fingers **taken simultaneously**

Plate No. 1

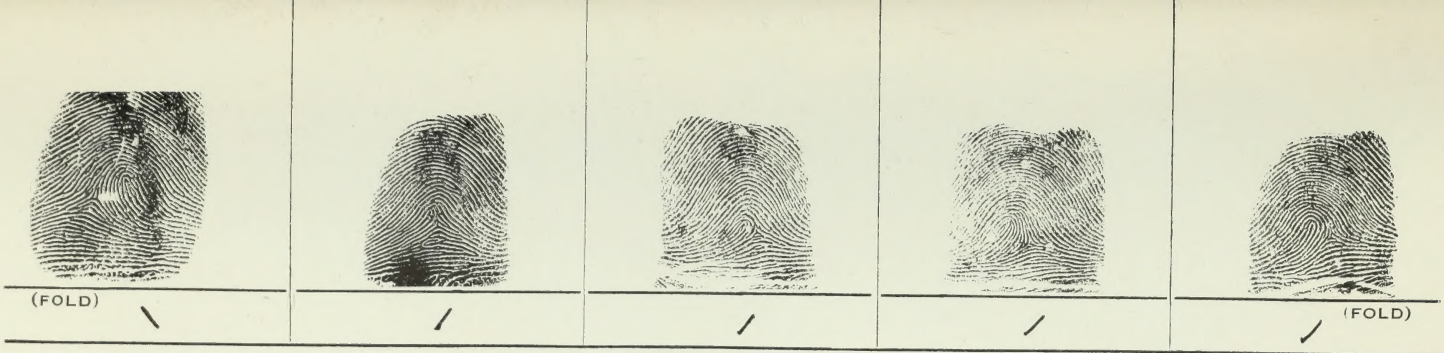
Classification $\frac{1}{1}$ $\frac{aA}{rU}$ 13

RIGHT HAND

1—Right Thumb	2—R. Forefinger	3—R. Middle Finger	4—R. Ring Finger	5—R. Little Finger
				13 
(FOLD) a	A	\	\	\ (FOLD)

LEFT HAND

6—Left Thumb	7—L. Forefinger	8—L. Middle Finger	9—L. Ring Finger	10—L. Little Finger



LEFT HAND

Plain impressions of the four fingers **taken simultaneously**

RIGHT HAND

Plain impressions of the four fingers **taken simultaneously**